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[GENERAL ANNOUNCEMENT.]

## THIRTY-FIRST ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

AMERICAN GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY,
58 WILLIAM STREET, N. Y. CITY,
September 16, 1903.

There will be an annual meeting of the American Gas Light Association held at Detroit, Mich., October 21st to 23d, 1903.

The meeting will be called to order by the President, Alten S. Miller, of Baltimore, Md., at 10 A.M., Wednesday, October 21st.

The Meeting Hall will be announced later.

The headquarters will be in the Russell House, Detroit, Mich.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may be averted.

The Russell House is conducted on both the American and European plans, and the rates for rooms will be as follows:

American Plan: Rooms without bath, $3 per day for each person; rooms with bath, $4 per day for one person, or $7 per day for two persons ($3.50 per day for each person) and upward. European Plan: Rooms without bath $1.50 per day for each person; rooms with bath, $2.50 per day for each person, and upward.

Another hotel is the Cadillac, which is not far from the Russell House, and the rates of which are about 50 cents per day higher than those quoted by the Russell House.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will, at the door, receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the hands of the Secretary by October 11th, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"Our Correspondence School," by Mr. Alex. C. Humphreys, New York City.

"The Advantages of Enrichment," by Mr. Arthur G. Glasgow, London, England.

"Municipal Ownership," by Mr. H. L. Doherty, New York City.

Other papers are promised, but the authors have not yet decided upon the exact titles, so the announcement of them will be deferred.

If the papers are of a sufficiently high standard, the Beal medal will be awarded to the author of the best paper presented, the question of which is best to be decided by the proper committee.

A lecture will be delivered to the Association.

During the days of the meeting all the announcements will be posted on the bulletin boards at the headquarters and meeting hall. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work, by affording a ready means of recognition.

In order that the year book containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given that, if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving Detroit, but not after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned in to the printer immediately after the adjournment of the meeting.

*Special.*—The entertainment will include a smoker Wednesday evening, a banquet on Thursday evening, and a steamboat excursion on Friday. The boat will stop at various points of interest. For the ladies there will be a theater party on Wednesday evening, and the banquet and excursion as above. The price of tickets for each person will be $5.


LIBRARY OF CONGRESS. SEP 28 1903 SMITHSONIAN DEPOSIT

It will be necessary for members to procure a ticket for each lady accompanying them. Please fill out and mail to the Secretary at once the inclosed postal card, so that the Committee of Arrangements may know how many are to be taken care of. A. E. FORSTALL, Sec.

## BRIEFLY TOLD.

THE WESTERN GAS ASSOCIATION AND THE WORLD'S FAIR.—Too late for reproduction in this issue we received a copy of a circular prepared by Mr. Frederick H. Shelton, as President of the Western Gas Association, which gives in clear, distinct manner the way in which it is proposed to cause the Western Association to represent the gas industry at large at the World's Fair, to be held in St. Louis, commencing May 1st, 1904. The arranging for this matter was left in the hands of President Shelton for initiation, by vote of the meeting in Indianapolis last May, and to say that it was put in good hands needs not the telling, for the initial circular amply attests to the careful thought that Mr. Shelton has given the matter from about every possible standpoint that it could be viewed. His plans are simple and we take no chance in saying that they will result in an exhibition on the part of the gas industry that will be a feature of the Fair. Of course, general co-operation is asked for, and Mr. Shelton stands ready to answer any questions that may be asked him concerning the scheme and its carrying out. His address is Pennsylvania Building, 15th and Chestnut streets, Philadelphia, Pa. One descriptive paragraph in the circular is here reproduced:

"Arrangements have substantially been made by which the Association will have suitable space in the very center of one of the principal buildings, namely, the Palace of Liberal Arts, 525 feet wide by 750 long, costing nearly $500,000. Formal application for the space has been filed, and it is understood that the Association will have it when the allotments are made. The matter herein is contingent upon the due securing of the space, of which, however, I believe there is no question. In this space it is proposed to illustrate the standard *processes* (not undemonstrated ones) of gas manufacture and distribution, by machinery (if small in size), or by models, parts, plates, photographs, samples of raw materials, residuals, mains, meters, joints, tools, testing apparatus, etc. Also to illustrate, as fully as may prove possible, *the early forms* of the same things, in contrast to standard types and practice, constituting an historical exhibit of the greatest interest. Also, to assemble the fullest possible collection of *appliances* for the use of gas, by having not only standard burners, heaters, ranges, and engines, but the special appliances used in many manufacturing and trade industries that serve to create the large day load of many places. Such exhibit should be of great educative value to the public and very helpful to the visiting gas man."

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NOTES——

APPLICATION was recently made, in the Edgar County Circuit Court for the appointment of a receiver for the Paris (Ills.) Gas Light and Coke Company. The correspondent who forwarded this note, under date of the 21st inst., further said: "This action is taken by the bondholders of the Company in connection with the foreclosure of mortgages to the amount of $50,000. There is also outstanding indebtedness to an equal amount, upon which judgment was to have been taken at the November term of court, and it is to forestall this and protect the bondholders that the receiver is applied for. The Company became seriously embarrassed through the installation of a central hot water heating plant two years ago, and the inability to secure from the City Council an amended franchise, permitting a higher maximum rate for the service, made the operation of the plant impracticable."

WE are informed that a compromise between the authorities of St. Paul, Minn., and the St. Paul Gas Light Company has been virtually agreed upon, respecting the future supply of artificial gas in that city. The Commission which has been considering the matter of a renewal of the franchise for the Gas Company since last December reports adversely on the proposition to establish a municipal lighting plant, but places itself on record as favoring a renewal of the Company's franchise for 25 years in return for concessions made by the Company with regard to prices. The Company is to reduce the price of gas at once from the present rate of $1.30 per 1,000 cubic feet to $1.15 per 1,000. On January 1 of each year 5 cents shall be clipped off the rate until $1 per 1,000 cubic feet has been reached in 1907, after which the city shall have the power of fixing the price of gas to consumers. The maximum charge for gas for lighting the streets and the public buildings shall be $1 per 1,000 cubic feet. Moreover, the Company agrees to a 5 per cent. gross earnings' tax and to begin the work of extending its mains as soon as a franchise has been granted.

[Continued from Page 446.]

## ELEVENTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD IN SAN FRANCISCO, CAL., JULY 21-23, 1903.

FIRST DAY—AFTERNOON SESSION.

Following the vote of thanks to Mr. Britton for his paper, this took place:

*Desultory Discussion*

Mr. Lowe—The value of a paper is shown by the discussion it brings forth; in fact, a paper that is discussionless is valueless.

Mr. Aldrich—I should like to ask Mr. Britton what those wonderful calculations are that he has been making?

Mr. Britton—I intended to bring that matter up to-morrow. A year ago you will recall that I described to you a sale of gas stoves at $7.90 each. I stated then that a year later, if I were living, I would present facts to prove the truth of my position that it was a profitable thing for a gas company to do. I now have the figures. I kept tab on every stove sold. We sold altogether 378 stoves that have been in constant use. Most of them were listed stoves from approved makes. In the city of Alameda the average sale per stove was 28,000 cubic feet per annum, and in Berkeley the sales averaged 32,000 cubic feet. These are essentially cities of homes where there are no disturbing factors; in Oakland the average was very much less. The figures are these: The total sales for all the stoves amounted to 6,557,700 cubic feet, which on the 378 stoves gives an average consumption of 17,300 cubic feet per stove for the year. The average annual revenue per stove was $21.65—we got $7.90 for the stove—so that our total revenue per stove, including gas sold, was $29.55. The stoves cost us set up an average of $16.50 each, as near as I can figure it, which shows a profit of $13.05 upon each one sold. If your gas cost 50 cents per 1,000 in the holder the cost of the gas supplied to each stove would be $8.65, or a profit of $4.40 per stove for the year, over and above all costs and charges.

Mr. Clements—What about the cost of distribution?

Mr. Britton—The distribution of that much additional gas did not cost a cent. I presume, too, that 75 per cent. of these people would not have bought stoves, except on the basis of the special price. Some of the stoves have used as much as 8,000 cubic feet a month. A number, however, in the houses of rich people, who use them only to make a cup of tea occasionally, have consumed not more than 100 feet.

Mrs. Enloe—Mr. Lowe, how are you to manage slow cooking with an oven? Would you agree to eat a pan of biscuit baked in 20 minutes as readily as you would one baked in 7? Your method may work as to boiling water, but not as to baking.

Mr. Lowe—Probably 75 per cent. of the gas consumed is used in the top burners.

Mrs. Enloe—Not now.

Mr. Lowe—Yes, I think so; if you will consider everything. In some houses no baking is done, in others almost none. There is no question at all but that there are certain exceptions; but to my mind they only prove the rule. There is a good, average working condition. I operated a gas works in Troy, N. Y.,[1] at one time, in the early days of the fuel gas business. Gas was high, and we had to do everything we could to lower the cost. Studying the question thoroughly I found that the argument of being able to boil water in 5 minutes was a fallacy; there was too great an increase in cost, because of the extra amount of gas used.

Mrs. Enloe—I have found that frequently you can turn the gas off and finish the cooking with the heat radiated by the hot stove.

Mr. Lowe—Another point. If you are cooking anything (I do not care what it is) that requires boiling, raise the temperature of the water to 212°. That is all you can get. If you put a volcano under the water you could get no more than the 212°. You must raise the water to 212° within a reasonable time; after that you can cut off the gas 75 per cent. and still keep the same temperature, which means an enormous saving that people do not understand. If I were to place a burner under a kettle and a thermometer on top you would find that with the water just simmering it would remain at 212°. If you turned on more gas you would simply be converting more water into steam.

The President, in announcing an adjournment to 10 A.M. of the following morning, said that a popular lecture, on "Liquid Air," would be given by Prof. G. A. Bobrick, at 8 P.M., in the regular meeting rooms. The lecture, which was accompanied by experiments and demonstra-

1. Mr. Lowe should have told the entire story.

tions, was duly given, after which a supper was served in the Techau Tavern, which entertainment was very much enjoyed.

[For the text of Prof. Bobrick's lecture, see JOURNAL, Aug. 24, p. 282.]

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SECOND DAY—MORNING SESSION.

The President called the meeting to order at 10:15 A.M. In calling for the regular order the President said—we have some

ROUTINE BUSINESS

to go on with that may now occupy our attention profitably. As you know, we now have a very efficient Library Committee, and as it is essential that the committee be all residents of San Francisco, where they can meet frequently and discuss library affairs, I think it is for the interests of the Association that this committee should stand as it ts. Therefore, I reappoint Messrs. F. C. Jones (Chairman), L. P. Lowe and George W. Holberton as such committee.

In regard to the Advisory Board, I am informed that Mr. John Martin does not wish to serve on any committee this year. I will, therefore, reappoint Messrs. Britton and E. C. Jones, and in place of Mr. Martin, Mr. Papst of the Equitable Company, San Francisco. You will understand that this Advisory Board of necessity must be men who reside in the same locality. For that reason I have appointed all this committee from the membership residing in San Francisco. The Secretary has a number of

TELEGRAMS, LETTERS

and the like to read.

The Secretary—I have here a huge budget of letters and telegrams from absent members and friends, all expressing regret at their absence from the meeting and tendering to the Association their best wishes. Amongst the names of the writers are those of Messrs. F. H. Shelton, Henry L. Doherty, S. W. Sterrett, Jno. D. McIlhenny, N. W. Gifford, Wm. S. McKay, Alten S. Miller, Fred. S. Benson and E. C. Jones. I will read you Mr. Jones' letter, knowing that every member who is present here to-day will be glad to hear from one who has labored so long and earnestly in the interest of the Association, and who has, until now, never missed attendance at any of our meetings. Here is the letter:

SAN FRANCISCO, CAL., July 17, 1903.

Mr. J. B. Grimwood, Secretary of Pacific Coast Gas Association: Will you kindly convey to the members of the Pacific Coast Gas Association an expression of my sincere regret that I shall be unable to attend our Eleventh Annual Meeting. I am sore at heart to be obliged to forego the pleasure of meeting my old friends in the Association and taking part in the proceedings.

This is the first time that I have been unable to attend a meeting, and I would like you to assure the members that my absence is unavoidable. You have my hearty wishes for a continuance of the successful career of our Association and a most delightful and instructive meeting.

I realize that many changes have taken place in the gas business during the 10 years' life of our Association, but I thankfully realize that there have been no changes in the warm hearts, the cordial handshakes, and the close fraternity of the men who make up the Pacific Coast Gas Association; and may God bless it always.

Fraternally yours, E. C. JONES.

The President—The next thing on the programme is the paper, by Dr. C. T. Deane, on

## THE OIL INDUSTRY OF CALIFORNIA FROM A COMMERCIAL STANDPOINT.

[For the text of Dr. Deane's paper, see JOURNAL, August 31, p. 322.]

Although Dr. Deane is not a member of the Association, he was requested to write this paper since the subject is of much interest to the gas industry. The Doctor prepared the paper with a great deal of care, and, as Secretary of the California Petroleum Miners' Association, knows all that there is to be known in regard to the oil business.

*Discussion.*

The President—You have heard a very valuable paper on a question vitally interesting to us. I desire at this time to have Mr. Lowe open the discussion, touching on what oil has done for gas on the Pacific Coast. Mr. Lowe has been prominent in the introduction of the use of oil for gas making.

Mr. Lowe—It is with some little hesitancy that I mention anything connected with the use of oil in the manufacture of gas. You all know the peculiar position I occupy on the Pacific Coast as the builder of gas works using oil only, and I therefore have a little delicacy in speaking of the subject in open meeting of the Association. There are some questions I would like to ask Dr. Deane, however, after which I will tell you a little about the use of oil, if you wish. The Doctor has mentioned there being 1,000 million barrels of oil in storage. I don't remember whether he said in the Kern river district or in the State.

Dr. Deane—In the Kern river district.

Mr. Lowe—Now, as gas men, we use the word "millions" pretty freely. Millions of feet of gas mean nothing to us. A thousand millions means very little to the minds of most men, and it certainly means very little to my mind. It is very difficult to grasp it. If I understand the Doctor correctly, we will soon use 50 million barrels per annum. I would, therefore, like to know if our oil supply is limited to about 20 years?

Dr. Deane—The 1,000 million barrels of oil I mentioned are in 4,000 acres of land in the single district of the Kern river field. Besides, there are thousands of millions of barrels in other districts.

Mr. Lowe—That is what I wanted to get at. Then we may look forward to more than 20 years' use of oil?

Dr. Deane—You can look forward to your grandchildren having all the oil they want. There are probably many districts where oil has not been discovered, but in which it probably will be discovered. Near the district I speak of (and I speak of it more particularly because it is now producing the largest quantity of oil) are other districts—the Sunset and Midway, the McKittrick, and up further, the Coalinga district, which, perhaps, is going to be richer than any of the others. When I speak of 1,000 million barrels, too, I do not include the great southern districts, such as the Santa Maria, where they are producing 1,000 barrels a day at present.

Mr. Lowe—Can you give us information with reference to the Watsonville district?

Dr. Deane—I did not mention the Watsonville district because I did not want to boom any. I can do it; but my position will not permit me to, and I do not want to. They have at Sargents' (which is called the Watsonville district) a district that they think is good. They have one good well which will probably produce from 50 to 75 barrels a day—they say 150; but whenever an oil man tells you 150, cut it in half. Oil men lie like horse traders. They cannot tell the truth. They are worse than gas men. (Laughter.)

Mr. Lowe—You spoke of it being a good investment to purchase oil lands because you had a natural warehouse full of oil, where you could leave it if necessary. I would like to ask if it is not necessary to drain your land coincident with the draining of the adjacent lands by your neighbors?

Dr. Deane—Suppose my land adjoins yours. If I begin to sink wells next to your land precedent compels me to sink them 100 feet from your boundary—there is no law about it. I am going to take some of your oil from you. You sink your wells in a corresponding position along the other side of the boundary. If you will look at a map of the Kern River district you will find that this state of affairs exists all the way through it. The Peerless Oil Company has wells on one side of its border and the Kern Company has wells along the other side; but, strange to say, those Peerless wells do not show any deterioration.

Mr. Lowe—If I own a tract of oil land bordered on opposite sides by the lands of other companies. Suppose they are both pumping and that I am not; will they not eventually drain my land?

Dr. Deane—Only along the edge. One well will not drain more than an acre of land, the oil sand is so sluggish and slow.

Mr. Lowe—So that if I purchased a piece of land lying between two others I might reasonably suppose that most of my oil would be left. Would that apply as fully in the Coalinga district?

Dr. Deane—I do not know that it would. The light oils might flow a little more; but the expert opinion is that a well will exhaust about an acre of oil sand all around. It might perhaps be a little more. In Baku they put a well to an acre. In Spindletop they put a well to every 25 feet, and, as you see, that exhausted Spindletop quickly. Of course, there is some oil coming out yet; but a comparatively small amount.

Mr. Lowe—You remarked that coal could not be landed in San Francisco for less than $6.50.

Dr. Deane—That is what the coal men tell me. I derived my information at first hand. The Western Coast Coal Company and Mr. Harrison (who publishes a coal paper here) tell me that they cannot land coal in San Francisco under about $6.50.

Mr. Lowe—Last year I purchased coal for about $3.75.

Dr. Deane—What kind of coal?

Mr. Lowe—Screenings. They are not suitable for domestic purposes, of course; but neither do we use fuel oil for domestic purposes.

Dr. Deane—As I understand it, screenings are only what you have left after you have sold your coal. Screenings may be considered a bye-product. However, I want to say that at the Olympic Club, where we burned coal up to two years ago, we bought screenings and paid $6.50 a ton.

Mr. Lowe—It so happens that I am connected with a concern manufacturing coke as well as gas; and, notwithstanding the fact that I am an ardent advocate of the manufacture of gas from oil, I am looking forward to a time when oil will be too expensive for that purpose. I believe oil will be worth more for other purposes than for gas manufacture. I believe the time will come when we must go back to the manufacture of gas from coal. Now there are millions of tons of coal in Washington. We have a good deal in California. While all the Washington coals are classed as lignites, they are very near true coals. Probably the best indication of the difference between a coal and a lignite is whether it will coke or not, and I class as coal that from which coke can be made. For several years we manufactured gas from that coal and had an excellent quality of coke, and really, for our purposes, we have a good coal here. What is to become of the enormous deposits of coal? Is oil going to keep them in the ground? If so, it certainly must be at a very low price. I remember that when screenings in San Francisco were selling at $4.50 delivered, one of the sharpest experts in America showed that oil would have to be sold at 75 cents per barrel under the boilers to compete with $4.50 coal. Possibly the boilers were not quite as well adapted for the use of oil as for the use of coal.

Dr. Deane—A fair comparison is 4 barrels to the ton.

Mr. Lowe—On the assumption that coal is brought out at a low rate, that means that oil should not exceed $1 a barrel.

Dr. Deane—My impression is that oil will be worth $1 a barrel and ought not to go above that to compete with coal. At that price the oil men can make all the money they want.

Mr. Lowe—I believe that the coal mine owners of the Pacific Coast will in time awaken. I think they are very sluggish just now; very much asleep. Mr. Howard read us an interesting paper last year in which he expressed the same thought. In the East coal mining is certainly conducted under very much worse conditions. It costs much more for the production of a ton of coal than in Washington, yet we can buy coal delivered throughout the East, transported by rail a greater distance than it is necessary to transport it here, and get it for a less sum than we are paying; and a coal in every way superior to the Washington coal, too. It seems to me that this condition of affairs must in time prevail. The coal miner will get less for his coal; the transportation man will get less for the transportation of the coal (which necessarily must come by water), and under these conditions we may expect that the price of oil will be kept down. That product from which we can get the cheapest gas is the one we are naturally going to use. I do not think that oil can ever advance in the San Francisco market, for instance, to much more than 75 cents per barrel and compete with coal.

Dr. Deane—You have to take into consideration that gas manufacture cuts a very small figure. We use twice as much oil in sprinkling roads.

Mr. Lowe—I am speaking strictly of steam making purposes. The use for steam making purposes is that which governs the price of oil or coal now. I think that the apathetic condition of the coal man is past, and as soon as he sends his product here at a reasonable price, I believe that oil cannot cost more than 75 cents a barrel. If it costs 75 cents we can use it advantageously for gas purposes; if it costs much more, some of us must switch back to the manufacture of gas from coal.

Dr. Deane—You are aware that they are making coke from oil?

Mr. Lowe—I am quite familiar with it. The coke that is made from oil, of course, is common to all oil distillation. It is a residue left in the stills after the volatile oils are boiled away. It is undoubtedly a very pure form of carbon—a very porous product—and satisfactory for a great many uses. At one time in the East I used it for the manufacture of water gas, but I believe that it has become too valuable to use for the purposes of fuel. They find a ready sale in the East for the coke in the manufacture of electric carbons. I was going to ask you what they were doing with the coke made in oil distillation on the Pacific Coast.

Dr. Deane—As far as I know there is no coke made except by the Richmond Refinery. That coke is selling in carload lots at $7 a ton.

Mr. Lowe—For what purpose?

Dr. Deane—I think it is being used to some extent in smelting, but I do not know and cannot find out. There are large quantities going to Stockton. I have no correspondents in that district.

Mr. Lowe—It might do for certain forms of smelting.

Dr. Deane the oil coke packs when it is used for smelting, forming a mass so that the metal cannot run down.

Mr. Lowe—In the iron industry they realize the fact that it is necessary to have a firm and hard quality of coke to sustain the burden of the ore.

Dr. Deane—They are mixing coal coke with oil coke, and that gives a very much better smelting proposition than either alone, for the oil coke is much hotter than the coal coke, and the coal coke keeps the oil coke from matting, allowing the iron to run down between.

Mr. Lowe—Is it necessary to use it in the form of a briquette?

Dr. Deane—No; just the lumps.

Mr. Lowe—You mean they take a certain amount of coal coke and a certain amount of oil coke and mix them together.

Dr. Deane—Yes.

Mr. Lowe—I think coke made from oil in oil distilleries will always command a greater price for scientific uses and for the manufacture of certain articles from carbon, such as electric carbons, and that the price which it will command per ton will make it prohibitive for domestic fuel.

Dr. Deane—It is selling cheaper than coal coke.

Mr. Lowe—They have not developed their manufacturing field. They are just trying to get it out of the way for the time being. That condition once existed in the East. The Standard Oil Company formerly had great difficulty in disposing of its coke. In Lynn I purchased coke from Cleveland and brought it in cheaper than I could buy coal. It is extremely light and there are not many pounds in a carload. That condition of affairs did not last long. The oil produced in the Lima fields in Ohio was at one time very cheap, but Lima oil has become far too valuable for refining purposes to permit of its being used for the manufacture of gas. The same applies to oil coke. We may have a considerable amount for sale now, but that condition will not last.

Mr. Britton—I think one proposition brought out in the discussion ought to be in some way corrected in the minds of our members. From the very inception of the burning of oil for steam purposes the erroneous impression has prevailed that comparisons should be made by stating the number of barrels of oil that were equal to a ton of coal. Any man who has had anything to do with the use of oil for steam knows that that is an erroneous plan. The only possible test is the evaporative test. How many pounds of water will a pound of coal evaporate; and how many pounds of water will a pound of oil evaporate? Of course, much depends upon your coal, the construction of your furnaces and the character of the oil. Oil theoretically, under the very best test, will evaporate between 16 and 16½ pounds of water, with forced draft. Welsh anthracite will theoretically evaporate about 11 pounds. Practically oil will not do better than 13 under the very best conditions. Welsh anthracite will do about 9; screenings between 4½ and 6. The best bituminous coal we have on the Coast is the Wellington, and Wellington has never done better than 8. That is the only basis for figuring, and ought to be used as the basis in place of the number of barre's as compared with a ton. I am sorry that Dr. Deane got away. I wished to ask him a question. My opinion is, from the use of Coast oil, that we have one with a paraffine base. The particular oil came from Moody Gulch, Santa Cruz county, and was used by our Company for a great many years for the purpose of making gas. I am satisfied that it is largely, if not entirely, of a paraffine base. Oil from Pescadero bears the same peculiarity. Oil has been found in Alameda and Contra Costa counties with a decidedly paraffine base. The oil from Coalinga has more of a sulphur base than asphaltum, and there is some little trace of paraffine.

Mr. Lowe—Was the oil of which you speak of a strictly paraffine base, or was there a slight proportion of asphaltum?

Mr. Britton—The Moody oil is strictly a paraffine base, but there is no more to be had. The wells are exhausted. It was first introduced in 1884 or 1885.

Mr. Prettyman—Oil of a strictly paraffine base has been found in 12 or 15 fields, but it has been produced in commercial quantities only at Moody Gulch.

Mr. Eichbaum—Mr. Britton stated the whole case, but he did not go to its length. The Oakland Gas Company had oil for several years from Moody Gulch of from 51 to 52 gravity that was entirely a paraffine base. That I know from the officers of the Pacific Coast Oil Company. Mr. Ballard showed me tons of paraffine taken from the oil. As Mr. Britton states, the oil from Pescadero was also of an entirely paraffine base. Consequently no one need despair of finding any quantity of oil in California with a paraffine base. I should have said nothing, except to corroborate Mr. Britton's statements.

On motion of Mr. Clements a hearty vote of thanks was extended to Dr. Deane for his paper.

The President—The next paper, which is of more than common interest to the Association, is that by Mr. Franklin Riffle, on

WROUGHT PIPE.

As Mr. Riffle is one of the new members of our Association, I think we are to be congratulated on this occasion. The subject of which he treats is especially interesting at this time, because so many gas companies are considering going into the business of high pressure distribution.

[For the text of Mr. Riffle's paper, see JOURNAL, Aug. 17, 1903, p. 246.]

The President—As the luncheon hour is at hand, and no objection being offered, I think it would be best to postpone the discussion on Mr. Riffle's paper until the afternoon session, which will be convened promptly at 2 P.M.

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SECOND DAY—AFTERNOON SESSION.

The President reconvened the sessions at 2:10 P.M. The first thing considered was the question,

"What is the best practice with regard to the maintaining, etc., of Welsbach lights?"

Mr. Philo Jones—I would like to find out the experience of any company in this regard. How are we to arrive at the cost? What is a proper charge per month for maintenance? I have heard all sorts of figures given, and would like to know from some member who has adopted the system what his charge has been.

Mr. Ross—We have had a little expertence in that line. Our lowest rate is 10 cents a light for 10 lights or more. I send a man around once a week to put on clean chimneys and to renew the mantles wherever necessary.

The Secretary—Do you find the charge of 10 cents sufficient to reimburse you? Does it include replacing the mantles?

Mr. Ross—Yes; and I find it covers all cost where the consumer has 10 lights or more. We have an increasing rate for fewer lights.

Mr. Jones—Does the consumer pay the original cost of installation?

Mr. Ross—Yes; he does.

Mr Osborn—My custom has been to charge the market price for the mantles—that is, say 20 or 25 per cent. above the cost price—and set them for the price charged. The labor is usually paid for by the profit on the mantle.

Mr. Burrows—In this connection I would like to ask about the cost of maintenance of the Humphrey or other gas arc lamp, so called.

The Secretary—I think Mr. Valentine has had considerable experience in the matter of the cost of maintenance of the various forms of gas arc lights. If I am not mistaken, he makes a certain monthly charge for maintenance.

Mr. Valentine—We have in Sacramento about 72 gas arcs in use. We supply the arcs, put them in place free of cost and maintain them, furnishing renewals of mantles, globes and shades when necessary (so far we have not had to renew the globes or shades), for 50 cents per month. It takes one man's time 1½ days a week to attend to them. The cost of maintaining an arc for a month I figure at about 45 cents. The idea was to make them merely self sustaining.

Mr. Ross—What arc do you use?

Mr. Valentine—The Humphrey 4-burner arc.

The next question was regarding the

"Application of electricity to heating."

The Secretary—It has been tried in some clubs and restaurants in the East, but it has not been found economical.

Mr. Lowe—Probably the most economical method of heating by electricity is water heating. It is not very economical then; but you can at least get all the heat into the water and then use it as a direct hot water heating system.

The President—We will now take up the

*Discussion*

on Mr. Riffle's paper on "Wrought Pipe."

Mr. Aldrich—I realize that our time is limited this afternoon. Mr. Riffle went into the matter so thoroughly that there remains to my mind nothing to be said except to take exception to a few of the conclusions at which he arrived. I was very glad to hear his remark with reference to the "Converse" pipe which is also made by the National Tube Company. We have cast iron Converse joints and wrought iron pipe in use in our city. Mr. Riffle made a slight error in giving the composition of Kalamein. I feel now more sure than ever that Kalamein pipe will stand electrolysis and electrolytic action better than any other pipe, for the same reason that the author of the paper stated to you that it was a preservative of wrought iron pipe, the latter being immersed in a bath of asphaltum, the pipe being heated to the same temperature as the composition. The element of Kalamein pipe is neither more nor less than ordinary, black standard pipe. They prepare a bath, which, as a matter of fact, is tin, nickel and lead (not zinc)—we know the hardening process that nickel will give to anything, as so ably shown by the wonderful demonstration we had last evening when Prof. Bobrick exposed a 5 cent piece to the action of his liquid air—the pipe is placed in this bath which is heated to a cherry red. The pipe, as the author stated, attains the same heat as the bath itself. The pipe assimilates the contents of the bath, is taken out and cooled, and is then treated with a paint of asphaltum. The only objection that I have to the Kalamein pipe, and I believe the National Tube Company, in accordance with a strong presentation that I made of my case to them, is about to increase the weight of the joints. It is my opinion that they do not allow sufficient lead room. I think a little more lead should be used in the joint itself. I believe that is going to be done in the near future. Kalamein pipe is the most easily handled of all pipe, because of its longer length and because you can easily bend it to any reasonable degree in going around jogs. It is cheaper in the long run because of its longer life. We recently took up a portion of main on South Monroe street, wherein we had 4 blocks of 6-inch Kalamein pipe that was laid in the ground in the earliest history of our Company, about 14 years ago. It had the old-fashioned, flanged joints. During my connection with the Company there has never been a leak of any kind or character in that length of pipe or in any of its joints; and I really am becoming converted to the flanged joint as being absolutely perfect and gas tight. The only portion of the pipe that was at all pitted was at the extreme end where the electrolytic action does the most injury and where the pipe went across the car line. Otherwise the pipe was in as good condition as it was the day it was put in. When it was scraped it was perfectly bright, and all it required was my celebrated coating of rubber and tar. (Laughter.) With reference to asphaltum, I was very glad to hear a description of the proper method of applying it. Hitherto I have had no belief in asphaltum for coating mains themselves; but if, as the author stated, it is necessary to heat the pipe to the same temperature as your bath, the result would be far better. I have in mind the case of the Pacific Coast Galvanized Wire Wood Pipe Company who once used asphaltum. Of course, the pipes being of wood, they could not subject it to a very considerable heat. I know that because they got a cheap price on asphaltum paint they painted this wood with asphaltum. It appeared to me to be very thin, so that when it dried you could even take your finger nail and scratch off the asphaltum. They returned to the use of tar for coating and preserving their pipe. I believe that Kalamein pipe is particularly suited to long distance transmission, owing to the length of the pipe and to its being so much harder than either wrought iron or cast iron. One question I wish to ask the author of the paper—we have probably from 16 to 20 miles of wrought iron pipe in the ground. Will he be kind enough to tell me at what distance, if any, expansion joints should be placed? In the north, as you are perfectly aware, we have very severe cold weather, the frost penetrating a depth of 4 or 5 feet into the ground. If it were not that we are perfectly immune from condensation in our mains I believe we would have great trouble.

Nr. Riffle—I hardly feel prepared to answer Mr. Aldrich's question in regard to expansion joints. Of course, the distance varies, as Mr. Aldrich knows, with the locality, from 200 feet to many thousand feet. Probably Mr. Aldrich's experience would be of some value to us.

Mr. Aldrich—We cannot afford the beautiful things you see in the "Novelty Department." For an expansion joint on a 4-inch pipe I take a piece of 5-inch wrought iron pipe. I cut the wrought iron pipe in the middle of the flange at the distance of an ordinary block, about 700 feet, and put on an expansion joint about 16 inches long. We have yet to find one that gives trouble. We never have the slightest difficulty with the expansion joints slipping; but in long distances I should certainly advise putting in expansion joints of some kind, because, notwithstanding the strength of the joints, we do have breakages. It shows the wonderful power contraction has when its opponent is a piece of iron.

Mr. McNeil—A few years ago I built for the Westinghouse people, in Pittsburg, about 15 miles of 36-inch pipe. The expansion joints we used were nothing but the old-fashioned expansion flange. When the pipe was 36 inches in diameter the expansion flange was 5 feet. At the outer edge of the pipe was put a 2-inch bar, and that was riveted together. They were placed at distances of 1,000 feet. They never had a particle of trouble with the pipe.

Mr. Riffle—I want to thank Mr. Aldrich for calling attention to the slip made in giving the composition of Kalamein pipe. As he stated, tin takes the place of zinc. I have brought here this afternoon some samples of bar steel and refined iron, also of steel pipe and guaranteed wrought iron pipe, which may be of some interest to the members.

Mr. Britton—I feel that the subject must have been during my absence sufficiently discussed to warrant me in not taking it up at great length. The question in the end really resolves itself into individual opinion based upon local conditions. I think that Mr. Riffle has covered the points of difference between steel and wrought iron pipe when he states that, unless you can determine positively the character of the soil and the water, and have a long time for making this determination, you cannot say offhand whether one pipe is better than the other. Our experience with steel pipe has been fairly good. At first its use was a disappointment. We could not get dies or cutters strong enough to cut it. We found that in certain of the alkaline soils it would oxidize very rapidly. It would rot, particularly in adobe soils or where there was ammonia in the soil. Latterly we have used steel pipe very extensively and have found it to serve the purpose equally as well as wrought iron pipe. I will ask Mr. Riffle to correct one expression in the opening part of his paper—as Mr. Lowe and Mr. Aldrich have their "babies" I also have mine. There is one misleading statement in Mr. Riffle's opening remarks concerning the adoption of high pressure transmission. He fixed the date at 3 years ago. As a matter of fact, high pressure transmission of artificial gases has been in use for at least 25 years. If he will change "transmission" to "distribution" it will be nearly right. Transmission under as high a pressure as 25 pounds has been in use for 25 years.

Mr. Riffle—Perhaps I used the term "high pressure" in a little different sense from that which a gas engineer would use it. I referred to much higher pressures than 25 pounds.

Mr. Ross—We used steel pipe in San Francisco and had a great deal of trouble with it. It does not seem to be thick enough to stand the threads. When it came to putting threads on it would split up sometimes 3 or 4 feet.

Mr. Osborn—To my mind the most important thing brought out in this paper is that merchant pipe is not good for mains or services, that is, the steel butt-welded merchant pipe which Mr. Riffle tells us is more under weight than over weight. It is subject to cracks. There being a taper to the threads of the pipe there are only 2 or 3 threads that are gas tight. You all know that gas is the hardest thing to hold in a pipe. If you have a gas leak it gets larger all the time.

Mr. Keyes—I had a little experience with a car load of pipe guaranteed to us by a reputable firm to be absolutely wrought iron pipe. Before it was in the ground we used two sets of dies and as many cutters.

Mr. McNeil—Another thing about iron and steel pipe. I contend, and my experience has taught me, that wrought iron tubing for boilers, made of wood charcoal iron, will outlast two sets of tubes of steel, give greater satisfaction, and be safer in all ways.

Mr. Riffle—Mr. Waters, General Manager of the Spreckels Sugar Company, made the statement to me to-day that he had tested thoroughly both charcoal iron boiler tubes and steel boiler tubes at Salinas, and that he could get the best results unquestionably from steel and would never use charcoal iron tubes again. It would seem to be a question of local conditions. In some cases steel may make a better showing than charcoal iron, and in other cases the reverse is undoubtedly true. Generally speaking, I think that the wrought iron people will have considerable difficulty in making good their claim that steel is very much inferior to iron when it comes to the matter of corrosion.

On motion of Mr. Lowe a vote of thanks was extended to Mr. Riffle for his valuable paper. [To be Continued.]

[Continued from page 450.]

## Variations in the Lighting Power in the Incandescent Burner of Combustible Gases.—No. III.

By E. Sainte-Claire Deville.

[Abstract translation in *Journal of Gas Lighting* of a paper presented to the International Photometric Committee.]

II.—*The Measurement of the Quality or Power of a Gas for Incandescent Lighting, with a Definition of a Proper Photometric Method.*—Passing on to the laws of combustion as affecting the incandescent burner, it will be remembered that the researches conducted in the experimental works on the combustion of coal gases of different qualities in a Welsbach burner were made with gases ranging in quality from the poorest to the richest, and a number of conclusions drawn from the results obtained.

In the first place, the facts as to the maximum duty[1] obtainable were found to be as follows: With a No. 1 Welsbach burner, and any coal gas whatever, there exists, for every consumption, a maximum duty which corresponds with a certain value of the ratio $\frac{A'}{G}$ existing between the volumes of air and gas which mix at the base of the burner. When the values for the maximum duty and the corresponding values of the ratio $\frac{A}{G}$ are determined by experiment for gradually increasing consumptions of the same gas, it is found that the duty and the ratio both go on increasing with the consumption until a certain limit is reached. When this absolute maximum is reached, the duty ceases growing. In fact, it soon decreases if the consumption of gas is further increased. $\frac{A_1}{G}$ however, remains unchanged at its maximum value. These conclusions hold good with all the different qualities of gas; but each quality of gas has a distinguishing characteristic—viz., the magnitude of the duty or maximum lighting power and the corresponding value of the maximum for $\frac{A}{G}$. Taking things broadly—that is to say, without regard to minute variations—it can be said that coal gases consumed under the conditions necessary for their maximum duties give almost exactly the same intensity of light for a given quantity of heat. The corollary of this fact is that, for the same quantity of heat produced, the duty obtainable from a given volume of two different gases is proportional to the heats of combustion (by volume) of the gases. The proportion of air to gas, $\frac{A}{G}$ varies likewise—whatever the gas—with the heat of combustion of the gas.

As has been already noted, the aim of these numerous experiments has been to compare the lighting power (incandescent) of different gases; but when the series of tests was planned, there was no accepted definition of what is rightly called the lighting power (incandescent) of a gas. Obviously, as with the ordinary illuminating power, the incandescent lighting power can be defined in a general way, as "the duty (or intensity per 100 liters of gas per hour)[3] obtained on burning the gas in a Welsbach burner of the certain definite construction and such that each gas can be burnt under the conditions which best suit it." The question arises, what type of burner is implied here, and under what exact conditions must the gas be burnt? Various considerations show that, in dealing with these questions, it is convenient to adopt a provisional definition of the lighting power (incandescent) of a gas. This is comprised in the following: The type of burner is to be a No. 1 Welsbach fed with air; and the lighting power (incandescent) of the gas is to be measured by the absolute maximum duty of the gas when burnt with the largest proportion of air which can be used with it.

From the figures already given of 15 samples of coal gas tested with the No. 1 Welsbach burner, a table can now be compiled which displays the incandescent lighting power. The gases had all practically the same theoretical temperature of combustion—viz., 1,950° C., and are arranged in order of their heats of combustion (water as steam).

We have now only to consider the case of ultra poor gases burning with a blue flame, the most interesting of which is water gas. These gases cannot be used with the ordinary Welsbach burner with previous admixture with air. Indeed, mixture with air is not necessary, since the flame has no tendency to deposit soot on contact with the mantle. In devising a burner specially adapted for the combustion of these ultra-poor gases, regard had to be paid to the requirement that the photometric tests should be comparable with those of ordinary coal gas. With this object in view, it was essential that the three following conditions should be fulfilled:

1. The burner to be supplied with measurable volumes of air and gas, in order that the combustion may be adjusted to the maximum luminous intensity for a given volume of gas consumed.

2. The arrangement of the delivery tubes to be such that intimate mixing of the two gases takes place as completely as possible on their meeting at the lower part of the mantle.

3. The burner should accommodate the same mantle (No. 1) as that used for coal gas.

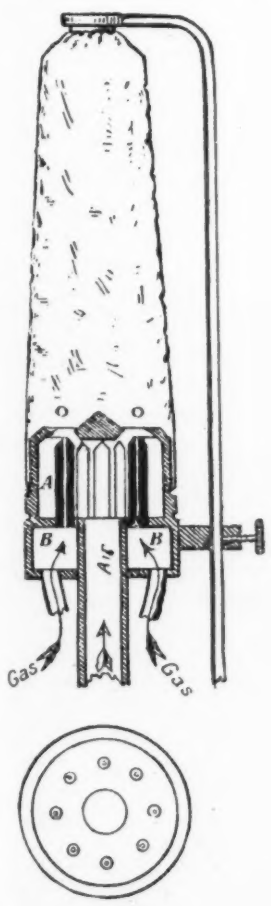
1. "Duty" is here held to be the quality of light produced by 100 liters of gas, or its reciprocal—viz., the consumption of gas per carcel.

2. The nomenclature adopted in this paper is:
A.—Volume of air introduced, per hour, at the base of the burner.
G.—Volume of gas " " " " "
I.—Intensity of the light of the burner.
C.—Heat of combustion (calories) of gas per cubic meter at 10° C. and 760 mm. (constant pressure and water as steam).

3. Or inversely, the consumption of gas per carcel.

TABLE III.

| No. | Description. | Mantle Closed. | Heat of Combustion at 10° C. and 760 mm. Calories. | Ordinary Illuminating Power or Consumption per Carcel in the Standard Bengel Test Burner. Liters. | Duty or Lighting Power (Incandescent), as defined above. This item is given in its two usual forms: (a) Number of Carcels per 100 Liters of Gas Consumed per Hour; and | (b) Consumption of Gas per Carcel. Liters. | Proportion of Air to Gas $\frac{A}{G}$ at the Base of the Burner Under the Conditions of Maximum Duty. |
|---|---|---|---|---|---|---|---|
| 1 | Coal 1 end of charge | K | 3,489 | Nil. | 6.77 | 14.9 | 3.18 |
| 2 | " i " " | H | 3,868 | 299.4 | 7.76 | 12.9 | 3.64 |
| 3 | " k " " | J | 4.264 | 168.2 | 7.36 | 13.6 | 4.03 |
| 4 | " j " " | I | 4,343 | 164.3 | 7.62 | 13.1 | 4.22 |
| 5 | " h middle " | G | 4,395 | 162.2 | 8.13 | 12.3 | 4.14 |
| 6 | " l " " | K | 4,858 | 116.0 | 8.94 | 11.2 | 4.57 |
| 7 | " h " " | G | 4,936 | 112.1 | 8.33 | 12.0 | 4.72 |
| 8 | " j " " | I | 5.142 | 103.3 | 8.72 | 11.5 | 4.79 |
| 9 | " k " " | J | 5,332 | 92.71 | 9.07 | 11.0 | 5.11 |
| 10 | " i " " | H | 5,340 | 93.20 | 9.10 | 10.9 | 5.10 |
| 11 | " l beginning " | K | 5,587 | 94.56 | 9.52 | 10.5 | 5.33 |
| 12 | " h " " | G | 6,052 | 79.37 | 10.46 | 9.56 | 6.00 |
| 13 | " j " " | I | 6,358 | 95.02 | 10.48 | 9.54 | 6.12 |
| 14 | " k " " | J | 6,711 | 68.26 | 12.07 | 8.30 | 6.59 |
| 15 | " i " " | H | 7,023 | 65.85 | 12.65 | 7.90 | 6.78 |






It was found that a modification of the Strache burner answered these requirements. A burner, instanced as suited to practical needs, is shown in the accompanying diagram, in which *A* is the steatite air chamber, and *O* orifices by which the air reaches the mantle from the central delivery tube. *B* (of metal) is the gas chamber, having on its upper surface 8 nickel tubes, which conduct the gas to a point slightly below, but on the axis of the series of orifices.

It is noteworthy, in connection with the lighting power (incandescent) of water gas, ascertained under strictly comparative circumstances, that the water gas has a temperature of combustion distinctly higher than that of coal gas.

A table is given which, like the preceding one, shows how slight is the variation in the temperature of combustion of different samples of coal gas. In regard to this point both tables can be summarized as follows: 13 gases (taken towards end of distillation); temperature of combustion between 1,939° and 1,977°; mean, 1,951°; 15 average gases, representing the whole course of the distillation. Temperature of combustion between 1,946° and 1,997°; mean, 1,952.8°; 12 gases, taken at commencement of distillation—between 1,938° and 1,970°; mean 1,953.8°.

III.—*Summary and Conclusions.*—Since June, 1901, measurements have been made, in the experimental works of the Paris Company, of the lighting power (incandescent) of coal gas; the figures being quantitatively interpreted according to the definition already given. Observations were commenced with a moderate consumption of gas; the air supply being adjusted to obtain the maximum intensity for this consumption. This having been measured the test was repeated 3, 4 or 5 times with increasing gas consumption. In each instance the ratio of absolute intensity to gas consumed was ascertained; and it was thus discovered that this ratio gradually rises to a maximum, at which it remains for some time, and then falls. Taking the mean of all the determinations in which the maximum was practically constant, data are obtained representing the characteristic constants of the various gases. For example, in one experiment the data were:

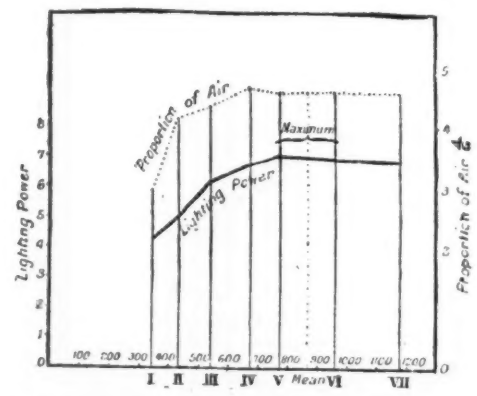
| | |
|---|---|
| Ordinary illuminating power—*i. e.*, consumption per carcel, at 10° and 760 mm. by Dumas and Regnault's method (liters) | 122.0 |
| Density of gas, at 0° and 760 mm. | 0.3695 |
| Heat of combustion per cubic meter at 10° and 760 mm. (water as steam (cals.) | 4,697 |
| Description of mantle | A |

*Determination of Lighting Power (Incandescent).*

| No. | Gas Consumed, Liters. G. | Air Consumed, Liters. A. | Ratio, $\frac{A}{G}$ | Absolute Intensity, Carcels, Ia. | Intensity per 100 Liters of Gas Carcels. | Heat Produced, Calories. G × C. | Intensity per 1,000 Calories. Carcels, $\frac{Ia}{G \times C.}$ |
|---|---|---|---|---|---|---|---|
| 1 | 74.0 | 218.0 | 2.95 | 3.20 | 4 32 | 347.6 | 9.21 |
| 2 | 92.4 | 384.0 | 4.16 | 4.68 | 5.07 | 434.0 | 10.79 |
| 3 | 115.5 | 502.5 | 4.35 | 7.20 | 6.23 | 542.5 | 13.27 |
| 4 | 144.0 | 670.5 | 4.66 | 9.96 | 6.92 | 676.4 | 14.73 |
| 5 | 165.0 | 753.0 | 4.56 | 11.68 | 7.08 | 775.0 | 15.08* |
| 6 | 204.6 | 942.0 | 4.60 | 14.28 | 6.98 | 961.0 | 14.86* |
| 7 | 251.1 | 1,155.0 | 4.60 | 17.31 | 6 89 | 1,179.0 | 14.67 |
| Mean of 5 and 6. | 184.8 | 847.1 | 4.58 | 12.99 | 7.03 | 868.0 | 14.97 |

*Zone of the maximum value

These results can be shown graphically by taking the quantities of heat produced as abscissæ and the intensities per 100 liters of gas as ordinates. The curves thus obtained indicate the facts already pointed out.


Proportion of Air
Maximum
Lighting Power
Lighting Power
Proportion of Air
100 200 300 400 500 600 700 800 900 1000 1100 1200
I II III IV V Mean VI VII

The effect of the mantle (on the luminous intensity per 1,000 calories) is very marked. By taking the means of three separate series of the gases—a different mantle being used in each series—it was found that the luminous intensity varied as follows:

| | |
|---|---|
| Mantle K | 14.69—1.00 |
| " A | 15.14—1.03 |
| " B | 15.70—1.07 |

Or a variation of 7 per cent.

Making a similar comparison, but of gases (rich and poor) in groups, it was found that the lighting power per 1,000 calories varied only 1 per cent.—a difference which is within the experimental error of the determinations.

In regard to this question also, the 15 gases given in Table III. may be grouped together into rich, medium and poor, and the following figures obtained, showing the relative values for the rich and poor gases, when the medium gas is taken as unity:

| | Heat of Combustion per Cubic Meter. Calories. | Heat Produced. Calories. | Lighting Power or Intensity per 100 Liters. Carcels. | Luminous Yield for Heat Produced. Carcels. |
|---|---|---|---|---|
| Rich gases | 1.24 | .93 | 1.25 | 1.01 |
| Medium " | 1.00 | 1.00 | 1.00 | 1.00 |
| Poor " | .79 | 1.06 | .85 | 1.07 |

Here, again, the difference between the yields of light per 1,000 calories is trifling compared with the same per 100 liters of gas.

Again, in 1894,[1] 42 samples of gas, varying in richness, were used by the author in a No. 1 Welsbach burner fed with air, and very similar to that which has been adopted as a typical burner. The heat produced was about 350 to 500 calories per hour. By grouping these gases into six sections, according to their richness, the following comparative figures are obtained, in which the average gas C is taken as the unit of comparison. The absolute values for gas C are: Heat of combustion 5,250 calories per cubic meter, consumption 71.14 liters per hour, and intensity of light 4.069 carcels.

1. The whole of this work was done with a single mantle, which was kept in good condition throughout the course of the experiments, a period of about 2 months.

| Gas. | Heat of Combustion. | Yield of Light. Per 100 Liters of Gas. | Yield of Light. Per 1,000 Calories. |
|---|---|---|---|
| A | .80 | .81 | 1.01 |
| B | .95 | .93 | .97 |
| C | 1·00 | 1.00 | 1.00 |
| D | 1.08 | 1.04 | .96 |
| E | 1.24 | 1.17 | .94 |
| F | 1.50 | 1.36 | .91 |
| G | 1.65 | 1.53 | .93 |

N. B.—Gases F and G were from cannel coal, and extra rich. C comprises the mean values of gases having almost the same properties as the normal gas of Paris, and is on this account taken as unity in the three columns.

Here, again, it will be seen that, among gases of extreme poorness and richness, the yield of light per volume varies from 80 to 153 per cent.; while per 1,000 calories it varies only by 10 to 12 per cent.

This relative constancy of the lighting power per 1,000 calories should be particularly borne in mind. It is true that experiments of this kind are rendered difficult by variations in mantles, and the difference in color between the light under examination and the standard. These factors account for some minor discrepancies between yield of light and heat expended; and it can still be stated with confidence that the lighting power (incandescent) of different gases, tested under certain comparable conditions, is practically proportional to the heats of combustion of these gases—always supposing that the quantity of heat expended does not exceed the quantity required for the maximum yield of light. The above statement has been ascertained experimentally only in regard to coal gases normally having a white flame and burnt in a Bunsen burner. The author believes that, with the same reservations, it applies almost equally to gases affording a blue flame (extra poor coal gas, water gas, etc.); but further experiments with a burner on the lines of that already mentioned are necessary to exactly confirm this supposition.

Considering, now, the interesting, though less economical, case in which, by increasing the consumption of gas and production of heat beyond that in each case necessary for the maximum yield of light, it will be found that poor coal gases permit a higher limit of brilliancy than do rich gases. This is because, in the case of poor gases, the products of combustion permit an actual temperature more nearly identical with the temperature of complete combustion than in the case of rich gases. In other words, dissociation becomes less predominant. In the case of water gas, theory indicates a higher temperature of complete combustion than in the case of coal gas; but the products of combustion contain more carbon dioxide, so that possibly the latter product tending, by dissociation, to limit the temperature, may discount the theoretical figure. However that may be, if not more than 600 to 700 calories are liberated with a No. 1 mantle, it will be found that, as with coal gas, the lighting power is roughly proportional to the heat of combustion of the gas. Water gas, however, should be burned in an Argand burner, such as that of Dr. Strache. Under these conditions, the mixture of air and gas is much less intimate, and may, indeed, be insufficient.

This comparison of gases and burners leads the author to say that there is nothing absurd in the statement that, for the same expenditure of heat, a burner for non-luminous gas may give more light than an ordinary coal gas burner. But in such a case the reason of the anomaly lies in the burner, and not the quality of the gas. The non-luminous burner would utilize its gas better than does the ordinary burner coal gas.

The researches of 1901 have convinced the author that the usual definition of lighting power (incandescent) which has already been provisionally adopted, is not the best. The idea of a maximum, reached by repeated trials, was an enticing one; but it involves a great intensity of light, and severe wear and tear of mantles. A more fitting conventional definition of lighting power would be as follows: Take a No. 1 mantle (as ordinarily manufactured, and of given size), and use it on an air-fed burner, suitable for coal or non-luminous gas, as the case may be. Place the burner at one end of the bar of the photometer, and the standard light (of known value) at the other; the distances of each from the screen for equal illumination being such that the absolute intensity of mantle No. 1 shall be equal to 8 carcels, or about 80 candles. This done, adjust the consumption of gas and air until the equality of the two illuminations is obtained on the screen with the minimum consumption. Under these conditions, the mantles will not be overtaxed, and many gases can be tested without changing the mantle.

The author contends that, if this method be applied with exactness to gases of known calorific power, the lighting powers will be found exactly proportional to the heats of combustion (water as steam). Hence, a photometric test is superfluous; the figure for calorific power sufficing to give the value of a gas for incandescent lighting. It would then only be necessary to accept the conclusions—

1. That heat of combustion is a true criterion of the value of a gas for incandescent lighting.

2. That figures representing calorific power in earlier documents should be taken to connote (in the absence of evidence to the contrary) calorific power at constant pressure (water as steam) per cubic meter of gas at 10° and 760 mm.

In the author's opinion, any factor for converting heat of combustion into lighting power would be unadvisable and misleading to the public, as it would not provide for the enormous variations of burners, etc.

It may be advisable for gas, such as that supplied by a company to a municipality, to be described in terms of both lighting and heating power, with the object of giving the necessary information to all classes of consumers. A long series of experiments, representing nearly 700 samples of gas, has shown that the heat of combustion of coal gas, enriched with benzol or otherwise, even when so low as to coincide with a lighting power of 14 to 15 candles or 105 liters per carcel, reaches at least 4,800 or 4,900 calories. Now, a gas of this richness is the best which can be supplied to a consumer using the ordinary incandescent burners working without special air supply. This gas is of such quality that the minimum lighting power usually imposed in the interests of consumers who adopt flat-flame burners amply insures the calorific power needed by consumers who employ incandescent burners.

Turning to the lighting power of mantles, the author supposes that the International Committee on Photometry will confine themselves to ascertaining and recommending a uniform method of testing the light obtainable with the various commercial mantle tissues. The following embodies the author's views as to how these determinations should be carried out:

1. Select a mantle material of given composition and mode of manufacture, and take the light it affords as unity.

2. The dimensions of the mantle should be those of No. 1 of the Société de l'Incandescence. Only mantles judged correct in regard to size to be used as standards.

3. Materials, tested for suitability for mantles, to be made up into No. 1 mantles, exactly like the standards.

4. A coal gas of medium quality to be used. The calorific power, measured before the experiment, to be between 4,900 and 5,200 calories per cubic meter.

5. The two mantles to be fixed to two burners with artificial air supply, and each to be supplied through a meter for air and gas.

6. First calculate the gas required to give exactly 600 calories per hour, and set the standard burner to this amount, adjusting the air to obtain the maximum intensity for this consumption.

7. The standard being now adjusted, proceed to obtain, with the other mantle, the same quantity of light with the smallest possible gas consumption.

8. This done, proceed, during any convenient time, to determine the consumption of gas and air which give this equal illumination of the screen.

9. The whole set of experiments to be finally repeated; using, however, the meters for the standard burner previously employed for the mantle under examination, and *vice versâ*.

10. $V^t$ and $V_e$ being the mean gas consumptions for the standard and sample mantles respectively, the quantities of heat will be—

$$C \times V_t \text{ and } C \times V_e ;$$

and the intensities for the same expenditure of heat—

$$\frac{1}{C \times V} \text{ and } \frac{1}{C \times V_e},$$

The ration of intensity of the sample mantle to that of the standard is therefore

$$= \frac{V_t}{V_e}$$

Thus, to take an example, if the two gas consumptions are $V^t = 120$ liters and $V^e = 127$ liters, the comparative value of the sample mantle is $\frac{120}{127}$, or 0.945.

It would be well, the author thinks, for the committee to go fully into particulars of the manufacture of the mantle to be used as the standard; giving details of the raw materials employed. Care should be taken to avoid identification of the mantle taken as the standard with any commercial article; for the first test of a mantle which was shown to be superior in lighting power to some one mantle on the market would seriously depreciate this latter. Tests of mantles as to their durability, etc., are very desirable; but the author leaves the study of methods by which these qualities are to be determined to those more competent to deal with them.

## A Plumber's Comments on Architects' Work.

By "D. F. N.," in *The Metal Worker.*

In the construction of private dwellings a great many architects fail to provide for or give attention to the space between floors that must be occupied by the rough part of the plumbing work. They make a set of drawings showing the size of pipes for soil, vent and waste lines, as required by law, and specify the different kinds of fixtures to be installed, and then forget the space between the floor and the ceiling, under the bath and toilet rooms, that must be left vacant for a proper length and width to receive the branch soil, waste and vent pipes which connect with the fixtures. In many instances it seems that no allowance whatever is made for the water supply pipes, which also branch out to these fixtures. They also forget the steamfitter's branches, the indirect heater man's requirements and those of the electrician and the gasfitter.

Now what is the outcome of such oversight? The plumber starts some of his soil, vent and waste stacks, and progresses with his roughing in work, when along comes the steamfitter with a kick, his claim being that the plumber has interfered with the run of his supply and return pipes, which cannot be run over or under the large soil branches, as his pipes must have the proper fall and must go just where he wants them to run and nowhere else. Of course, the plumber keeps right on, as his pipe, being the largest in size, is, in his estimation, beyond question, entitled to the right of way. This brings a consultation with the architect, who discerns where he is at fault in not showing in his drawing how to provide space in the framing for all these essential parts of the building. The natural resort to overcome the difficulty is to cut several inches into the wood beams, or in the case of iron beams, to cut through the flanges, and, if there is not enough space then, it is a case of cutting through the web of the beam, detracting from its strength and the value of the building.

All this could have been avoided if the architect had given the proper consideration to the matter and had taken care of the different parts of the building which he knew must be included. Even when the plumber was working in the cellar, and the steamfitter and other mechanics were about the buildings, it would have been a simple matter, and the course that would be pursued by a more considerate architect, to bring them into consultation in order to know their requirements and provide the space they needed, thus saving subsequent labor and providing the owner with a more substantial building. The plumber could tell the space necessary between the floors and the sizes of the chases to be left in the brickwork for his line of pipes, as shown in Fig. 1. The flooring timbers should have a header to give the space

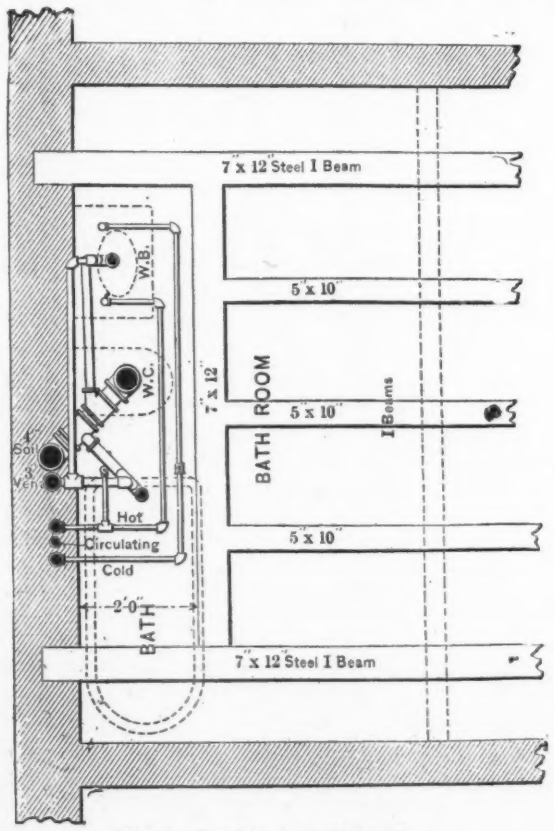



**Fig. 1.**—Provision for Bathroom Pipes.

necessary for the roughing in under the floors, extending inward at least 2 feet from the rough wall. After the plumber's work is completed this could be filled in with short timbers or small I-beams for the flooring and to give strength. The angle irons on the ceiling below to which the wire lathing is to be attached will take care of the finish underneath.

Such provision, carefully made, will give ample room and avoid trouble when the steamfitter, gasfitter and electrician come to work around the larger pipes of the plumber. The pipes and wires of the gasfitter and electrician, however, ought to be confined to the halls and kept as much as possible from under the floors to avoid trouble in case of a leak or a ground. Then, the tiled floors and walls of bathrooms would not have to be marred in making their repairs. Only a few days ago a plumber was given an order at the shop to start a job in what we in these days call a mansion. He went over the building and found chases left in the wall for the waste, soil, vent and supply lines. There were nine of these chases, each having an 8 × 3 channel running hard on the wall across their face, and there was not one of these chases that was not 5 inches scant in the width and 2 inches short in the depth. In order to get the pipes inside of the plaster on the finished wall line, as the specifications imperatively called for, everyone of these chases had to be cut out the required width and depth to admit the pipes. This consumed sufficient time to make a material delay in the whole work.

In some cases it is advantageous to carry the horizontal rough plumbing work under the original ceiling and then, when it is completed, cover it with a hanging ceiling, placed underneath the several pipes so inclosed. Such an arrangement is shown in Fig. 2. In office build-

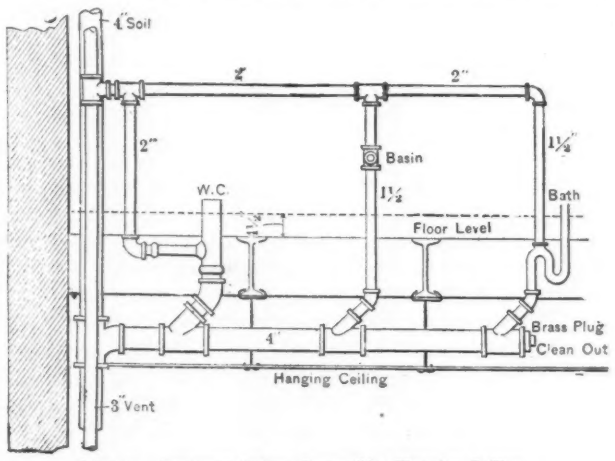



**Fig. 2.**—Drainage System Covered by Hanging Ceiling.

ings, schools, lofts and other buildings, where the horizontal drainage branches must always be accessible, they are hung below the ceiling and left uncovered, similarly to the arrangement shown in Fig. 2, without the hanging ceiling. This renders them readily accessible for extension or repairs, and, when the work is carefully arranged, neatly done and properly painted, the appearance is not objected to in buildings of the character mentioned.

In some buildings the plumbing is carried across the tops of the beams or arches and a platform with a 7-inch step at the entrance of the toilet room covers the pipes. The horizontal drainage run is brought out to the face of the marble base, where the platform terminates, and a cleanout is arranged for use in case of necessity, as shown in Fig. 3. This makes it far easier for the plumber to do his

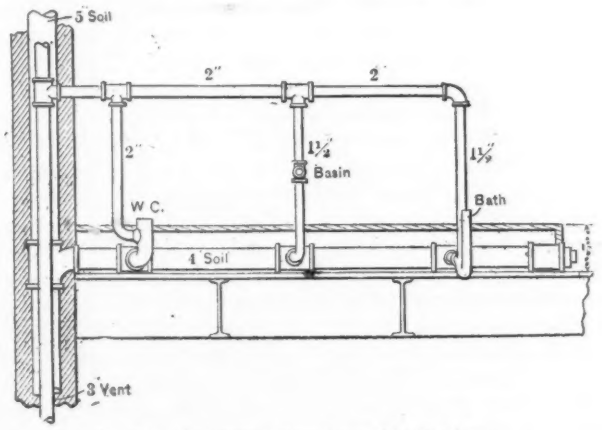



**Fig. 3.**—Drainage System Covered by Platform.

work and saves him the labor of building scaffolding and putting in hangers to support the pipes, as is required in work arranged as shown

in Fig. 2. Then beam clamps with hangers attached to them must clasp the bottom of the I-beams at one end and encircle the pipe at the other.

An easy method of connecting a 4-inch lead bend for a water closet, where there is scant space between the ceiling and the finished floor, is shown in Fig. 4. This will be found convenient in an overhauling job

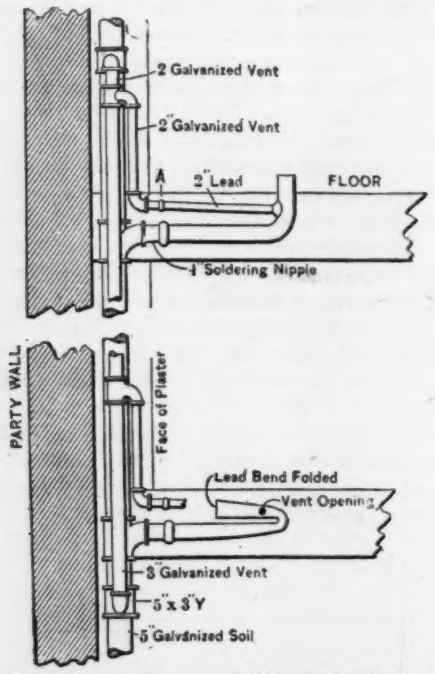



**Fig. 4.**—A Wrinkle for Overcoming Difficulty and Saving Labor.

where new wrought iron pipe is substituted for old cast iron or lead soil pipe. Under such conditions, when the Ys or T Ys are placed between the ceiling and the finished floor, it is found that the space is too small to allow a lead bend to turn, be it a short or a long bend. In such cases one method makes it necessary for the round joint to be wiped in a mean place between the beams, with not enough space between the bottom side and the ceiling to get up the heat necessary to wipe it, even with the assistance of a torch on the fitting, besides having the trouble of the brass nipple oxidizing from continually pouring on the metal, or the metal sweating through to the inside of the bottom. This can be gotten over nicely if the brass nipple is wiped on the bend on the bench, and then folded almost flat at the crotch, as shown in the lower part of Fig. 4, which makes the bend very similar to a straight piece of pipe. It can then be screwed into the fitting in the vertical soil line in the limited space provided for the work. When nearly screwed up tight it can be left lying on its side and an opening can be tapped in the side for the 2-inch lead vent pipe. When this branch is wiped on to the lead bend the bend can be turned a half turn home and tight. Then it is a simple matter to work out the kink at the throat of the bend with a dummy made of a ball of lead on a copper or brass wire. A careful workman can bring it to its proper shape, and almost as smooth as when it left the factory. Only one other joint will be required, and that is the one shown at *A* in the upper part of Fig. 4, connecting the lead pipe with the brass fitting that is to make up with the galvanized iron vent pipe.

If the architect would only confer with the plumber all of these practical details, which the plumber does not expect him to know, would be explained to him, and he could make provisions that would secure a correctly planned piece of work which would be better for his client, easier for the plumber and cheaper for both the plumber and the owner. When a plumber secures a contract he should, as soon as he has studied his plans, have a talk with the architect and explain some of the details that must be observed and point out some of the contingencies that may arise with the other mechanics. This may not always be an agreeable task, nor such information be courteously received, but inasmuch as it will result in a better completed job and a saving of money to several other mechanics, the plumber is justsfied and should feel it his duty to take up the battle, even if it may require the expenditure of some energy. The architect, although he may at times seem curt, has many things on his mind, but, in the main, is thankful for assistance on matters with all the details of which he is not familiar. It is a simple matter to bring him to his senses if he is unreasonable, by carrying out some of his outrageously incorrect plans and then pointing out to him that he is the Shylock that so nominated it in the bond.

[Concluded from page 452.]

## Electric Plant Failures: Their Origin and Prevention.

Table II. is interesting as showing the parts of the machines which originated the failure. Breakdowns to shafts were caused generally by the armature coming out of center through wear of the bearings, so that the unbalanced downward magnetic pull added to the weight of the armature produced a severe bending movement in the shaft. These cases are properly chargeable to the bearings. An interesting defect in dynamo and motor bearings, which sometimes occurs and requires watching to prevent damage, is the wearing of the bearing upwards. This sometimes occurs in cases where the armature has been placed nearer the top of the race than the bottom, in order that the upward pull of the magnets may relieve the pressure on the bearings. When the upward pull of the magnets is greater than the gravitational attraction, the bearings wear upwards, and allow the armature core to approach the pole tips when working. This, owing to its liability to escape detection, is a somewhat dangerous defect, for when the machine is examined at rest the armature clearance will appear satisfactory.

Most of the joint failures in wires are caused by bad workmanship. They have been, for the most part, confined to one or two makes of machines. Unfortunately, if a faulty joint is nicely finished outside, it is very difficult to detect until it causes trouble. This usually begins on the commutator surface. A number of joint failures are due to improper fastening of the commutator, but such have not been included in the percentage.

Commutators are responsible for 14 9 per cent. of the breakdowns, and these may be divided into two classes. The first, in which the insulation has broken down, most frequently occurs between the bars and supporting rings, the parts subject to the greatest difference of pressure. Such breakdowns often result in the burning out of the armature windings. To a much slighter extent breakdown of insulation between the segments occasionally occurs. This seldom results in more than a few coils being damaged. Only in a very few cases does a breakdown occur in the body of the insulation, permitting flashing through it. These few cases have all occurred where a material which absorbs moisture has been substituted for mica. Almost all the accidents to commutator insulation are due to the collection of oil, dust, etc., on the insulating ridges separating the segments from the clamping nuts. In many cases these ridges are made much too short, Sometimes there are no ridges at all, the insulation being flush or even sunk below the level of both bars and rings. The insulation at the outside end is usually most exposed to such accumulations, but being more easily cleaned fewer breakdowns appear to occur here than at the back end where cleaning is very difficult, sometimes impossible. Very few cases have occurred where insulation has broken down owing to the commutator wedging arrangements slacking back and permitting sufficient chattering to pulverize the insulation. This usually causes sufficient sparking at the brushes to draw attention to the defect before more serious mischief occurs. Defective fastening and keying of the commutator has caused 5.5 per cent. of the total number of accidents. Defective fastenings sometimes, although rarely, cause breakdowns of insulation, as described in the previous paragraphs. Bursting of the commutator by centrifugal force is not now so common as it used to be, and few cases are met with. As a general rule, the proportions of the parts are sufficient to resist the simple centrifugal stresses, and most of the bursts usually met with have been caused by improper locking arrangements. A cause of bursting of commutators which does not figure at all in this table is the bursting of the commutator owing to the bars being allowed to wear down too far. The defect or absence of keying of the commutators has caused in this class the largest number of breakdowns. When the keying is defective, the commutator is driven by the armature wires, and sometimes the commutator and the armature have slight relative motion on the shaft. This has caused a large number of breakages of the wires joining the armature to the commutator.

Starting switches of motors have been the cause or 4.7 per cent. of the breakdowns in the table, and the writer may say that this figure has been kept low by timely alterations to a number of dangerous switches. A not uncommon fault in starters which has caused burning out of armatures is a breakage of the wire near the last stop. In such cases, a careless attendant occasionally continues the use of the starter, subjecting the armature to very heavy starting currents by applying practically the full voltage to a standing armature. In this connection may be mentioned another very common fault which is found in starters for shunt motors—that is, taking the connection from the last stop of the resistance. This results in the voltage applied to the shunt at the moment of switching on being lowered to the same extent as the voltage

applied to the armature, with the result that, to get the necessary starting torque, the full load current has to be much exceeded. The starting torque can be kept up by attaching the shunt wire to the first stop in the resistance. When the switch is in the "on" position, the current for the shunt requires to flow back along the resistance, but, as a general rule, this is a matter of little importance, and where it is desirable to arrange otherwise, an additional stop can be put in the switch to cut out this resistance after the lever has reached the last stop.

Table III. sets forth as far as possible the conclusions reached as to the cause of breakdowns. Some of the headings in this table mean practically the same thing, but it seemed desirable to make out separate categories. For example, the heading "Dust and damp" might have been merged in the "Defective attention" heading; but a number of breakdowns have been caused by dirt and damp that could hardly have been attributed to defective attention on the part of the attendant.

The first of the main headings, "Constructional defects," is responsible for 39.36 per cent. of the total number of breakdowns. With greater laxity in supervision, resulting in a greater number of breakdowns, this heading would probably have been a smaller percentage. A number of the defects in design, construction, etc., were known to exist when the machines came under observation, but they were usually of such a nature that little could be done to remedy them without entirely reconstructing the machines. Almost half of the 39.36 per cent. of the total failures were due to bad designs, 7.4 per cent. to deterioration of insulation under normal conditions of working. The writer looks upon this latter as bad design, because it is the use of unsuitable materials or of materials under unsuitable conditions.

Comparatively few of the faults were found in the mechanical portions of the machines. Those usually took the form of insufficient keying, bad arrangement of bearings, and other defects familiar to all mechanical engineers. The great majority of the faults in design appear to be in the electrical portions of the machines, and for the most part take the form of supplying too little insulation, insufficient insulating ridges, improper arrangements for supporting the conductors and their insulation. The writer is afraid that, owing to the stress of competition, a number of designers sacrifice, to a great extent, reliability to cheapness. Particularly in the case of small and medium sized motors the tendency is to design machines having higher rises of temperature than experience has shown to be compatible with reasonable durability of the machine. No margin appears to be left for the slightly abnormal conditions that almost every machine sooner or later meets with in its working life.

Damp and dust, 7.4 per cent., refers to those cases where a reasonable amount of attention was given to the machines by the attendant, but where, owing to unfavorable conditions, it was not possible to keep the machine sufficiently clean and dry to prevent trouble. Dust is frequently somewhat hygroscopic, absorbing quantities of moisture. Defects from dust occur most frequently in semi-inclosed motors. These are splendid automatic dust bins; the provision for cleaning usually is insufficient; many of them cannot be cleaned properly without being taken apart, and it would in most cases be impracticable to do this every time the machine required cleaning. The defects in semi-inclosed motors might quite well be attributed to bad design or unsuitability, but the writer leaves the reader to place it as he thinks fit, with the advice to adopt, where necessary, wholly inclosed motors, large enough to run cool; and easily accessible open-type machines in all other situations.

## SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Sept. 10th., 1903.

*Review of the Present Position.—An Experiment on the Value of Packing Gas Cookers.—The Fiddes-Aldridge Gas Stoking Machine.*

The reports for the year ended June 30th last, as issued to the shareholders by the statutory gas companies, are of a satisfactory character, and exhibit signs of relief from the strained condition of affairs, due to the abnormally high price of coal, which has obtained for 2 or 3 years past. Reserve funds have been depleted to a serious extent, but this year they are being replenished, and in some cases reductions of price are announced. The latter part of the winter of 1902-3 was not favorable to sales of gas, and in one or two instances there is an actual decrease on the quantity sold as compared with the previous year. But these are the exception and not the rule. For the most part the usual rate of increase has been fully maintained, and the general experience is that the increase has attained all along the line, for lighting, heating, cooking and technical appliances. Wherever a competent endeavor has been made to meet the wishes of the customers, either by undertaking maintainance of incandescent burners on reasonable terms, the supply of appliances, the letting of apparatus on hire, or the utilization of the slot system as a means of introducing inclusive terms the result is a large accession of new custom of a character that is conducive to the stability and solidity of the business. As a result, contractors for the supply and erection of carbonizing, purifying or storage apparatus are having a good time. Enlargements staved off during the time when it was difficult to earn the dividends, are now cheerfully considered, and the public confidence is such that there is no difficulty in raising additional capital.

One important assistance to this state of affairs has been the improvement in the tar and sulphate market. These residuals have been in a poor, depressed state for some time, the figure offered for tar in particular being so low as to be a mere nominal price. But during the previous part of the present year it has been possible to obtain 30 to 50 per cent. advance, and standing expenses remain the same in any case, It is also clear profit. Nor is there any sign at present of falling off or weakening.

We are reminded by the longer evenings that the lighting season is coming on, and all who have made adequate arrangements for the incandescent trade are also reminded that gas is as much in demand for its primary purpose, that of providing artificial light, as ever it was. The reasons for this are not far to seek. Firstly, there is the great reduction in the price of mantles and burners. This trade was never in a more active state. It should also be mentioned that a good inverted burner has been put upon the market. There are several different sizes, and with these it is possible to get all the decorative effects obtainable with electric glow lamps, at a greatly reduced cost. Then the advantages of electricity have been over canvassed. The public have heard a great deal about poisonous fumes, smoke, soot and unconsumed gas. They have had their attention directed to the 9 or 12 inches of pipe between the tap and the burner on an ordinary gas fixture, and told that it is "full of gas" when the tap is shut off, and asked where "that gas goes to" in an impressive, sepulchral manner that supplies the answer. The destruction of the vitiating element in the atmosphere has been run for all it is worth and a great deal more, of course, without mention of the "destruction" brought about by the electric works' chimney. The proverbial carelessness of gasfitters has been turned to account and people are assured that they cannot have gas without escapes, and as to the effect of unconsumed gas upon the system—another awful pause. The result is that they have entered upon a trial of electricity with great expectations, which are not reached in practice. There is no appreciable difference or improvement in the atmosphere of the shop or home, the visits of the doctor are about as before, the services of the decorator and plumber are quite as much in demand, and there is either a poor light or a big bill. So the plain business man, who believes not only in efficiency but in economy, turns his attention to the incandescent gas light.

I have previously alluded to the improvements in gas cooking stoves and to the placing of a really efficient family cooker on the market at a low figure, not greatly exceeding 30s. The result has been a most satisfactory season's trade and gas companies who formerly ordered stoves singly now buy by the dozen. The principal firms of manufacturers are also to be congratulated on the promptitude with which they fill orders. I have repeatedly sent requisitions for two or three dozen stoves and in all cases received the same within a week, sometimes in three days. Frequently a dozen stoves have been ordered say on the 8th of the month and fixed and in use by the 15th. There is nothing like promptitude in filling orders as a means of facilitating business, and the fact that the stove was fixed within a week of filing the order is the best possible advertisement one can have. The old proverb says, "He who gives promptly gives twice," and this may be paraphrased with—he who fills an order promptly, gets a second.

Some tests that were conducted 20 years ago in connection with th Crystal Palace Gas and Electric Exhibition, went to show that there is little if any value in using asbestos or slag wool as a non-conducting packing for gas stoves. Speaking from memory, I believe it was found that the effect of removing the packing was an increased efficiency, which was explained by the assertion that the air in the double casing constituted as good or a better non-conductor than any solid medium. Some tests published by Messrs. R. & A. Main do not support this view, but show that the solid packing means an important saving of time and of gas. A packed oven was raised to 520° in 25 minutes with a consumption of just over 9 cubic feet of gas, while a similar oven, not packed, only reached 480° in 30 minutes with 12 cubic feet of gas. Two joints of

similar quality and weight were roasted. That in the packed oven wa done in 75 minutes with 18 cubic feet of gas, while the other required 95 minutes and 25 cubic feet of gas. A gallon of water in an open pan was raised to 212° in 42 minutes in the packed oven, by means of 16 cubic feet of gas. A similar quantity in the unpacked oven only reached 186° in 45 minutes. These figures show an economy of 25 per cent. in favor of the packing which is sufficient to suggest the importance of further investigation. It may perhaps be thought that the gas cooker, like the incandescent burner, has already been brought to such a high degree of economy in the matter of gas consumption, as to leave a very small margin for covering incidental expenses incurred in fixing these appliances, and that therefore such researches as the above are best let alone. But such opinions are a mistake. The wiser policy is to encourage endeavors to get the best possible value from the gas, and it is to be hoped that the interesting figures published by Messrs. Main will lead to further inquiry.

Considerable activity has been noticeable, not only with regard to methods of carbonization, as referred to last month, but also to mechanical methods of drawing and charging. Although Mr. West and others have been laboring at this fascinating problem for nearly half a century, and with a certain amount of success as instanced by the extensive adoption of machinery at several of our principal gas works, it is a fact that the bulk of the coal used for gas making in this country is charged and discharged by the simple hand process. Inventors have now another string to their bow in the shape of electrically driven engines. Steam, compressed air, and rope gearing have all been used, but it is evident that electricity offers particular advantages as applied to any kind of traveling machinery. And the interest taken in the question, even by engineers who have gone in largely for inclined retorts, seems to warrant the supposition that the sloper does not entirely fill the bill, and that the horizontal retort together with reliable machinery is capable of running it very closely. And some of the modern improvements show a marked improvement in respect to simplicity, space required and cost. The great difficulty hitherto has been that the machine can only be operated on one line of rails, so that to work it to advantage a retort house sufficiently spacious in the matter of length to afford regular employment for the apparatus, is indispensable and with through retorts a double set is required.

A special feature of all mechanical arrangements yet proposed is that they imitate the hand process. In the usual way of working, a number of lids are slacked and the retorts drawn. As soon as possible after they are emptied they are charged by a second and separate operation.

In a similar manner the retort house machinery is divided into two, the discharges and the charges. The former commences operations by drawing a convenient number of retorts, and the charger follows as closely as is practical in working. But now Mr. Wm. Fiddes, late Chief Engineer to the Bristol Gas Company, is in the field with an apparatus claimed to be capable of combining these two operations in one, rendering the time from the slacking of the lid to the closing of the same on the new charge a matter of seconds only. Mr. Fiddes has been working at the subject for years and with a certain amount of success.

Amongst other ideas he tried the use of air under pressure as a means of projecting the coal into the retort, but found the quantity of dust thus raised an objection. The present scheme, which is applicable to through retorts, but is only applied at one side (thus getting rid of the necessity for a double set of apparatus), and can be controlled by one man, comprises as its main feature a kind of push plate conveyor, which, when introduced into a retort, acts as a ram and drives the contents before it and out at the opposite end, and at the same time deposits the new charge in evenly spaced heaps along the floor of the retort. When the opposite end is reached, the pusher plates can turn at an acute angle with the horizontal, and in that position act as scrapers to level the charge during the return journey. The entire operation of drawing and charging is thus accomplished by one single forward and one backward travel for each retort. The discharging charger is described in the patent specifications as consisting of side plates, distance pieces between the side plates near their tops and division plates pivoted between the two side plates and adapted to swing from their vertical positions towards the forward end of the charger, but prevented from swinging beyond the vertical position towards the rear end. It is claimed that as the coke is not disturbed or broken up, but is pushed out in one mass, there is a distinct saving as regards the production of breeze or small; and that there is little or no flame at the mouthpiece, as the apparatus is out of the retort before the coal is kindled. The special advantages secured by such an arrangement are obvious.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following, from Mr. H. R. Clise, Attorney for the Citizens Light and Power Company, of Seattle, Wash., dated from that city the 17th. inst., is self-explanatory:

To the Editors AMERICAN GAS LIGHT JOURNAL: "I have noticed that you have taken some interest in the litigation in the United States Circuit Court here wherein the Seattle Gas and Electric Company questioned the right of the Citizens Light and Power Company to do business in this city, and in which Judge Hanford rendered a lengthy decision upholding the contentions of the Seattle Gas and Electric Company. On Tuesday, the 15th inst., the matter was before the United States Circuit Court of Appeals, on the appeal of the Citizens Light and Power Company from the decision of Judge Hanford. His decision was reversed, as appears by a copy of the order made at the time of the hearing."

---

A COPY of the decision was forwarded us by Attorney Clise, and its findings are appended:

"The Citizens Light and Power Company, appellant, *vs.* the Seattle Gas and Electric Company, appellee. United States Circuit Court of Appeals, Ninth Circuit.

"This cause came on duly and regularly for hearing this 14th day of September, A.D., 1903, upon the appeal of the appellant from the order of the Circuit Court of the United States for the District of Washington, Northern Division, granting an injunction *pendente lite* against the appellant, restraining and enjoining it until the final hearing of this cause from laying its pipes and mains in certain public streets, alleys and localities in the city of Seattle, King county, Washington, on the ground that the appellant herein had not the authority under the law to engage in the business of the manufacture and distribution of gas in the State of Washington, and it having been made to appear to the Court that, since the taking and allowance of the appeal from said order, the appellee herein and complainant in the Court below has abandoned its proceeding against the appellant here and defendant in the Court below, and has made a motion to dismiss its bill of complaint filed in said cause in the Circuit Court of the United States, for the District of Washington, Northern Division, and that said Circuit Court of the United States, for the District of Washington, Northern Division, has made an order dismissing said bill of complaint: It is now by the Court

"*Ordered:* That said order of the Circuit Court of the United States, for the District of Washington, Northern Division, granting said injunction, be and the same hereby is reversed, with costs to the appellant."

---

AT the annual meeting of the St. Joseph (Mo.) Gas Company the following officers were elected: Directors, Emerson McMillin, James Campbell, W. A. P. McDonald, S. C. Woodson, L. C. Burnes, Milton Tootle, Jr., C. A. Pfeiffer, H W. Hartwig and H. Krug, Jr.; President, Emerson McMillin; General Manager, K. M. Mitchell.

---

THE following statement respecting the earnings of the City Gas Company, of Norfolk, has been given out in Richmond, Va., in connection with other reports regarding the Williams properties in Norfolk, Va.—the figures cover the first 8 months of each year:

| | 1902. | 1903. |
|---|---|---|
| Income | $86,747.99 | $71,532.34 |
| Expenses | 42,471.27 | 37,586.76 |
| Net earnings | $44,376.72 | $33,945.58 |
| Bond interest and taxes | 22,808.20 | 22,813.84 |
| Surplus | $21,462.52 | $11,131.74 |
| Increase | ..... | $10,336.78 |

---

A CORRESPONDENT in Lansing, Mich., writing under date of the 19th inst., says: "A large interest in the Lansing Gas Light Company has been acquired by Mr. J. L. Fulton, of Chicago, who succeeds Mr. B. G. Dawes as President of the Company. The other officers are: Vice-President, Mr. T. J. Jones; Treasurer, Mr. G. B. Dawes; Secretary, Mr. L. E. Walker. Mr. Fulton will likely act as the business manager of the Company.

---

MR. R. J. CHAMBERS, Superintendent of the Montgomery (Ala.) Light and Water Power Company, has issued the following timely notice to the residents: "About October 1st there is an unusual rush of work in

our gas department caused by the renting of and moving into new houses by many of our patrons. In order to facilitate matters and have all changes made as near as possible before October 1st, we desire to ask those of our patrons who have definitely decided to move, to give us notice of their intention, stating street and number of new residence. By complying with this request as early as possible you will enable us to make all necessary changes in piping and otherwise ahead of time. We will disconnect all stoves and connect them up again in all new places, free of charge, but will not cart stoves. Your prompt attention will assist us and yourselves."

---

THE Louisville (Ky.) Gas Company is completing important main extensions in the northern section of the city. The scheme includes the putting of gas into the district known as Jacob's Park.

---

"R. T. W." is informed that the Directors of the Welsbach Light Company are Messrs. Sidney Mason, Thomas Dolan, Samuel T. Bodine, Randall Morgan, W. W. Gibbs, Walton Clark, B. W. Spencer and Lewis Lillie.

---

AT the annual meeting of the Jamaica Plain (Mass.) Gas Light Company the Directors elected were: Chas. A. Stone, John T. Burnett, F. Tudor, F. W. Rennick, Wm. Endicott, Jr., W. M. Butler and C. M. Weld.

---

AT a meeting of the Trustees of Rockville Center, L. I., held last Monday, an application for a gas franchise for the district was tabled, the application having been made by the promoters of the Nassau Gas Company. Henry Keith, Counsel for the Company, and W. A. Duke, its General Manager, in stating its position, offered to pay to the village, in consideration of the grant, 5 per cent. on the gross receipts, and also offered other minor returns.

---

ANOTHER recently incorporated gas concern for Long Island, N. Y., is known as the Port Jefferson Gas Company. Its incorporators are Messrs. C. A. Baylis, C. P. Randall and C. T. Fanning.

---

THE Barbourville Gas Company, to operate in Barbourville, Ky., has been incorporated with a capital of $100,000. Mr. M. C. Alford, of Lexington, Ky., is said to be the main one in interest. The place cannot support an enterprise of the sort under consideration, unless its managers propose to supply natural gas.

---

MR. THOMAS B. CARTER, Supervisor of City Lighting for St. Louis, Mo., will know more about gas meters after he has familiarized himself with the working of these faithful, though abused, measurers. The Laclede Gas Company is giving him every opportunity to perfect his knowledge.

---

THE new generating plant of the Pontiac (Ills.) Light and Water Company has been satisfactorily completed and will be in thorough working order in less than a week. The changes there exemplify pretty quick construction.

---

THE American Lighting Company has again been awarded the public lighting of Baltimore, Md., in so far as the illumination of the roadways by gas is concerned. The contract is to run for a year from March 1, 1904. The price does not differ materially from the rate now in force.

---

THE stockholders of the Jamaica (L. I.) Gas Light Company have elected the following Directors: E. R. Chapman, W. K. Rossiter, A. F. Stamford and C. A. Bramley. The same gentlemen were named to control the affairs of the Woodhaven Gas Light Company, the district of operation of which is west of the Jamaica Company's field.

---

MR. JOSEPH DEMPEL has been appointed Superintendent of the Bucyrus office of the Logan (O.) Natural Gas Company. He succeeds Mr. B. F. Spicer, who goes to Indianapolis, Ind., there to take up important work in the construction line for the Logan Company.

---

AT the annual meeting of the Worcester (Mass.) Gas Light Company the officers chosen were: Directors, Charles D. Lamson, Josiah H. Clarke, A. George Bullock, Francis H. Dewey, Albert Wood and S. B. Woodward; President and General Manager, Chas D. Lamson; Treasurer and Clerk, Jas. P. Hamilton.

---

ON and after January 1, 1904, the selling rate at Duluth, Minn., will rule at 90 cents per 1,000 cubic feet, net. The city, which has been in control of the gas situation at Duluth for some years, could better the position of the plant by expending a reasonable amount of money thereon.

---

THE works at Hannibal, Mo., are to be reconstructed. Hannibal is growing, and that the gas works are to keep pace with such growth looks well for the wisdom of the owners of the plant.

---

A BILL is before the Legislature of Alabama which authorizes the cities and towns of that State, who now own or control, or who may hereafter own or control gas, electric light or water works, to maintain and operate the same, by fixing rates that may not be challenged for the supply to ordinary consumers of the commodities so supplied.

---

THE proprietors of the Dover, Rockaway and Port Oram Gas Company, of Dover, N. J., propose to extend the main system to the outlying village of Mount Tabor.

---

THE residents of Greenwich, Conn., have again renewed their demands for a gas supply, which was promised them last year by the Greenwich Gas and Electric Lighting Company. The Company failed to keep its word, preferring to hold on solely to the furnishing of electric currents, so there is not much of fact in its title. The Greenwich electricians, however, might as well sooner than later take up gas making, for if they do not others will.

---

MR. CHARLES H. WILLIAMS, of the Madison (Wis.) Gas and Electric Company, has been appointed Editor of the Wrinkle Department of the National Electric Light Association.

---

IT looks that the proposed municipal gas works for Winnetka, Ills., is to be a reality. The village has voted the sum of $40,000 for the purpose of constructing the necessary plant.

---

THE proprietors of the Marlboro (Mass.) Gas Light Company have issued the following announcement respecting selling rates:

"The price of gas used for fuel and illuminating purposes, on and after Sept. 1. is reduced to $2 per 1,000 cubic feet, subject to the following discounts, if bills are paid on or before the 10th of the month, bills to be rendered monthly: For gas used for fuel purposes, a discount of 50 cents per 1,000 feet, making net price, if paid on or before 10th of month, $1.50; for gas used for illuminating purposes, a discount of 25 cents per 1,000 feet, making net price, if paid on or before the 10th of month, $1.75. Where gas is used in gas engines or for manufacturing purposes, a special price, subject to contract, will be made, depending on the amount of gas used. No discount will be made where the quantity of gas used for fuel purposes in the month is less than 500 cubic feet. No discount will be made where the quantity of gas used in the month for illuminating purposes is less than 1,000 cubic feet. A meter rental of 25 cents a month will be charged customers where less than 100 cubic feet a month or no gas is used, except, ho wever, that a meter rental of $1 a month will be charged where less than 500 cubic feet of gas is used in buildings lighted by electricity."

## Lord Kelvin on Radium.

According to special despatches recently received in America, by way of London, England, we are told: "What Prof. C. V. Boys termed 'the miracle of radium' has naturally received much attention in scientific circles. At the meeting of the science branch of the British Association Lord Kelvin, in a paper which he read, made an interesting suggestion in connection with its perpetual emission of heat at, according to M. Curie's calculation, a rate of about 90° C. calories per gram per hour. He said that if the emission of heat at this rate went on for 10,000 hours there would be as much heat as would raise the temperature of 900,000 grams of water 1° C. It seemed utterly impossible to Lord Kelvin that this would come from the store of energy lost out of a gram of radium in 10,000 hours. It seemed, therefore, absolutely certain that the energy must somehow be supplied from without. He suggested that ethereal waves might in some way supply energy to radium, while it was emitting heat to matter around it. Lord Kelvin illustrated his theory by the following comparison:

"Suppose a piece of white and a piece of black cloth, hermetically sealed in similar glass cases, were submerged in similar glass vessels of water and exposed to the sun. The water in the vessel containing the black cloth would be kept very sensibly warmer than that containing the white cloth. Here the thermal energy was communicated to the black cloth by waves of sunlight and was given out as thermometric heat to the water in the glass around it. Thus through the water there was actually an energy traveling inward in virtue of the waves of light and outward through the same space in virtue of thermal conduction. Lord Kelvin suggested that experiments be made comparing the heat emission from radium wholly surrounded with thick lead with that found in the surroundings heretofore used."

THE AMERICAN GAS LIGHT JOURNAL

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PROPRIETORS.

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
*Germany*—Lemcke & Buechner, of New York.
*England*—Aug. Siegle, 30 Lime Street, London.

MONDAY, SEPTEMBER 28, 1903.

## The Market for Gas Securities.

Matters in the Street were pretty uneven for some days, with a strong tendency to weakness, and the trouble culminated Thursday with a dazzling break. With the rest, gas shares had a fall that was almost a staggerer. Consolidated opened Thursday at 169, which was about one point lower than Wednesday's opening, and sold down to 166, which was the bid price at the closing. This break occurred on total sale of 2,010 shares. To-day (Friday) the low point of 165½ was made, the closing being reported at 167½ to 169. There is no reason whatever for the break, save the generally unsettled state of the market.

One sale of 100 shares of Brooklyn Union was reported for Thursday, at 170, which was a slump of 15 points from the last recorded sale of some weeks ago. The closing to-day was 170 to 190. Peoples, of Chicago, sold down to 90½. There is some demand for New Amsterdam 5's at 104 to 106, and Washington (D. C.) gas is 307½ bid. Consolidated, of Baltimore, was bought for New York parties during the week, about 700 shares having been taken. It looks very cheap at current quotations.

## Gas Stocks.

**Quotations by George W. Close, Broker and Dealer in Gas Stocks.**

16 WALL STREET, NEW YORK CITY.

SEPTEMBER 28.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

| *N. Y. City Companies.* | *Capital.* | *Par.* | *Bid.* | *Asked.* |
|---|---|---|---|---|
| Consolidated | $73,177,000 | 100 | 167½ | 169 |
| Central Union, Bonds, 5's | 3,000,000 | 1,000 | 105 | 108 |
| Equitable Bonds, 6's | 1,000,000 | 1,000 | 105 | .. |
| " 1st Con. 5's | 2,300,000 | 1,000 | 118 | 120 |
| Metropolitan | 658,000 | .. | 108 | 112 |
| Mutual | 3,500,000 | 100 | 280 | 295 |
| Municipal Bonds | 750,000 | .. | .. | .. |
| New Amsterdam Gas Co. Bonds, 5's | 11,000,000 | 1,000 | 104 | 106 |
| Northern Union, Bonds, 5's | 1,250,000 | 1,000 | 105 | 106½ |
| New York and East River Bonds 1st 5's | 3,500,000 | 1,000 | 102 | 106 |
| " 1st Con. 5's | 1,500,000 | | 109 | 111 |
| Standard | 5,000,000 | 100 | 135 | 140 |
| Preferred | 5,000,000 | 100 | 155 | 170 |
| Bonds, 1st Mortgage, 5's | 1,500,000 | 1,000 | 116 | 117 |
| Yonkers | 299,650 | 500 | 130 | .. |
| *Out-of-Town Companies.* | | | | |
| Brooklyn Union | 15,000,000 | 100 | 170 | 190 |
| " " Bonds (5's) | 15 000,000 | 1,000 | 119 | 119½ |
| Bay State | 50,000,000 | 50 | ⅛ | ¼ |
| " Income Bonds | 2,000,000 | 1,000 | . | 75 |
| Binghamton Gas Works, | 450,000 | 100 | 28 | 30 |
| " 1st Mtg. 5's | 500,000 | 1,000 | 93 | 96 |
| Boston United Gas Co.— 1st Series S. F. Trust | 7,000,000 | 1,000 | 82 | 85 |
| 2d " " " | 3,000,000 | 1,000 | 47½ | 50 |
| Buffalo City Gas Co. | 5,500,000 | 100 | 4 | 5 |
| " " Bonds, 5's | 5,250,000 | 1,000 | 73 | 76 |
| Capital, Sacramento | 500,000 | 50 | .. | 35 |
| Bonds (6's) | 150,000 | 1,000 | .. | .. |
| Central, San Francisco | 1,000,000 | .. | 105 | 108 |
| Chicago Gas Co. Guaranteed Gold Bonds | 7,650,000 | 1,000 | 104 | 104½ |
| Cincinnati Gas & Elec. Co. | 29,500,000 | 100 | 94¼ | 94½ |
| Columbus (O.) Gas Co., 1st Mortgage Bonds | 1,500,000 | 1,000 | 101 | 101½ |
| Columbus (O.) Gas Lt. & Heating Co | 1,682,780 | 100 | 88¾ | 89½ |
| Preferred | 3,026,500 | 100 | 107½ | 109 |
| Consumers, Jersey City Bonds | 600,000 | 1,000 | 100 | 102 |
| Consumers, Toronto | 1,700,000 | 50 | 218 | 225 |
| Consolidated, Baltimore | 11,000,000 | 100 | 64 | 64½ |
| Mortgage, 6's | 3,500,000 | .. | .. | 118 |
| Chesapeake, 1st 6's | 1,000,000 | .. | .. | .. |
| Equitable, 1st 6's | 910,000 | .. | .. | .. |
| Consolidated, 1st 5's | 1,490 000 | .. | .. | 112 |
| Consolidated Gas Co. of N.J. | 1,000,000 | 100 | 15 | 17 |
| " Con. Mtg. 5's | 880,000 | 1,000 | 85 | 87 |
| Consolidated G. & E. Co.'s. Little Falls, N.Y. | 90,000 | 100 | .. | 100 |
| Bonds | 75,000 | .. | .. | 100 |
| Detroit City Gas Co | 4,825,500 | 50 | 87 | 95 |
| " Prior Lien 5's | 5,603,900 | 1,000 | 99½ | 100 |
| Detroit Gas Co., 5's | 381,000 | 1,000 | 77 | 79 |
| " Inc. 5's | 16,000 | 100 | 98½ | 100 |
| Equitable Gas & Fuel Co., Chicago, Bonds | 2,000,000 | 1,000 | .. | 101 |
| Essex and Hudson Gas Co. | 6,500,000 | .. | 39 | 40 |
| Fort Wayne | 2,000,000 | .. | .. | .. |
| " Bonds | 2,000,000 | .. | 55 | .. |
| Grand Rapids Gas Lt. Co. 1st Mtg. 5's | 1,225,000 | 1,000 | 104½ | 105 |
| Hartford | 750,000 | 25 | 245 | 265 |
| Hudson County Gas Co., of New Jersey | 10,500,000 | .. | 25 | .. |
| " Bonds, 5's | 10,500,000 | .. | 101 | 103 |
| Indianapolis | 2,000,000 | .. | .. | 75 |
| " Bonds, 6's | 2,650,000 | .. | 104¾ | 106 |
| Jackson Gas Co | 250,000 | 50 | 73 | 75 |
| " 1st Mtg. 5's | 200,000 | 1,000 | 101 | 102½ |
| Kansas City Gas Light Co., of Missouri | 5,000,000 | 100 | .. | 36 |
| Bonds, 1st 5's | 3,822,000 | 1,000 | 102 | 104 |
| Laclede, St. Louis | 10,000,000 | 100 | 79 | 90 |
| Preferred | 2,500,000 | 100 | 85½ | .. |
| Bonds | 10,000,000 | 1,000 | 109½ | 110 |
| Lafayette Gas Co., Ind. | 1,000,000 | 100 | .. | 60 |
| Bonds | 1,000,000 | 1,000 | 60 | 65 |
| Louisville | 2,570,000 | 50 | 135 | 140 |
| Madison Gas & Elec. Co. " 1st Mtg. 6's | 350,000 | 1,000 | 107½ | 108¼ |
| " 6 per cent. scrip, due 1910 | 100,000 | 25 | 85 | 87 |
| Montreal, Canada | 2,000,000 | 100 | 218 | 184¾ |
| Nashville Gas Lt. Co. | 1,000,000 | 100 | 110 | .. |
| Newark, N. J., Con. Gas Co | 6,000,000 | .. | 56 | 58 |
| Bonds, 6's | 4,600,000 | .. | 105 | 105¾ |
| New Haven | 1,000,000 | 25 | 250 | .. |
| Oakland, Cal. | 2,000,000 | .. | 46 | 47 |
| " Bonds | 750,000 | .. | .. | .. |
| Peoples G. L. & Coke Co., of Chicago | 25,000,000 | 100 | 90¾ | 91½ |
| Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage | 20,100,000 | 1,000 | .. | .. |
| 2d " | 2,500,000 | 1,000 | 104 | .. |
| Rochester Gas & Elec. Co. | 2,150,000 | 50 | 88 | .. |
| Preferred | 2,150,000 | 50 | 118 | .. |
| Consolidated 5's | 2,000,000 | .. | 87½ | 90 |
| San Francisco, Cal. | 9,000,000 | 100 | .. | .. |
| St. Joseph Gas Co. " 1st Mtg. 5's | 751,000 | 1,000 | 95 | 96½ |
| St. Paul Gas Light Co. | 1,500,000 | 100 | 45 | 47 |
| 1st Mortgage 6's | 650,000 | 1,000 | 113 | 116 |
| Extension, 6's | 600,000 | 1,000 | 112½ | 115 |
| General Mortgage, 5's | 2,465,000 | 1,000 | 92 | 93 |
| Syracuse, N. Y. | 1,975,000 | 100 | 46 | 48 |
| Bonds | 2,047.000 | 1,000 | 98½ | 99½ |
| Washington, D. C | 2,600,000 | 20 | 307½ | 308¾ |
| First mortgage 6's | 600,000 | .. | .. | .. |
| Western, Milwaukee | 4,000,000 | .. | .. | .. |
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## DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Sept. 9, 1903.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Oct. 15th, 1903, to stockholders of record at the close of business, Sept. 30, 1903. Checks will be mailed.

1475-5 LEWIS LILLIE, Treasurer.

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**As Superintendent of Gas Works,**

By a technical graduate, with 9 years' experience as engineer, chemist and superintendent of coal and water gas plant and bye-product coke ovens. Three years' experience in metallurgy. Engaged at present in gas plant.

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1477-2

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**A Position to Take Charge of New Business Department, or to Canvas for Gas Ranges, House Piping and Store Lighting.**

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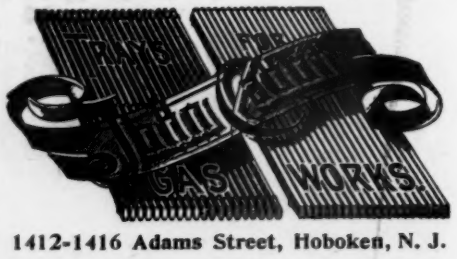


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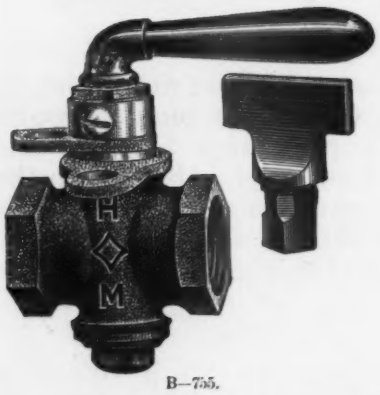

B—755.

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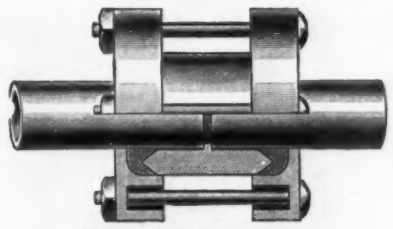
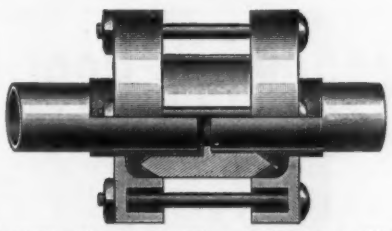
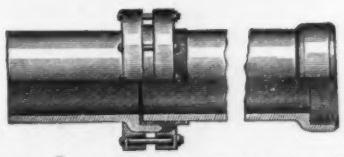


Regular Coupling. Style 1.

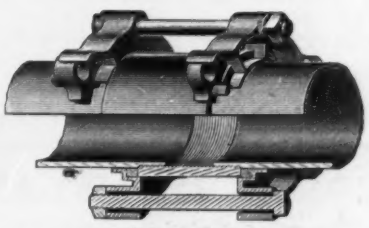


Insulating Coupling for Wrought Iron Pipe. Style 5.



Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.

Regular Sleeve. Style 2.



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My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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BY UTILIZING A

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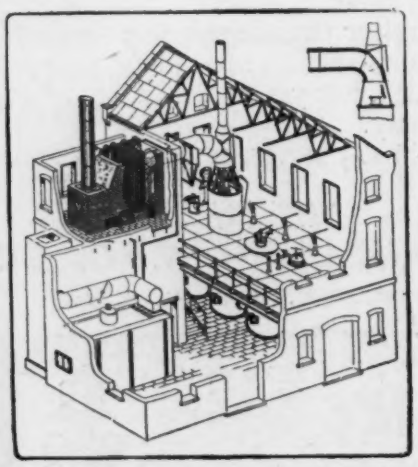

**To absorb the heat now going to waste when you blow through your superheater to heat the feed water for your boilers to the temperature of the steam. This is now being done at the Poughkeepsie Gas Works, Poughkeepsie, N. Y. : : : : :**

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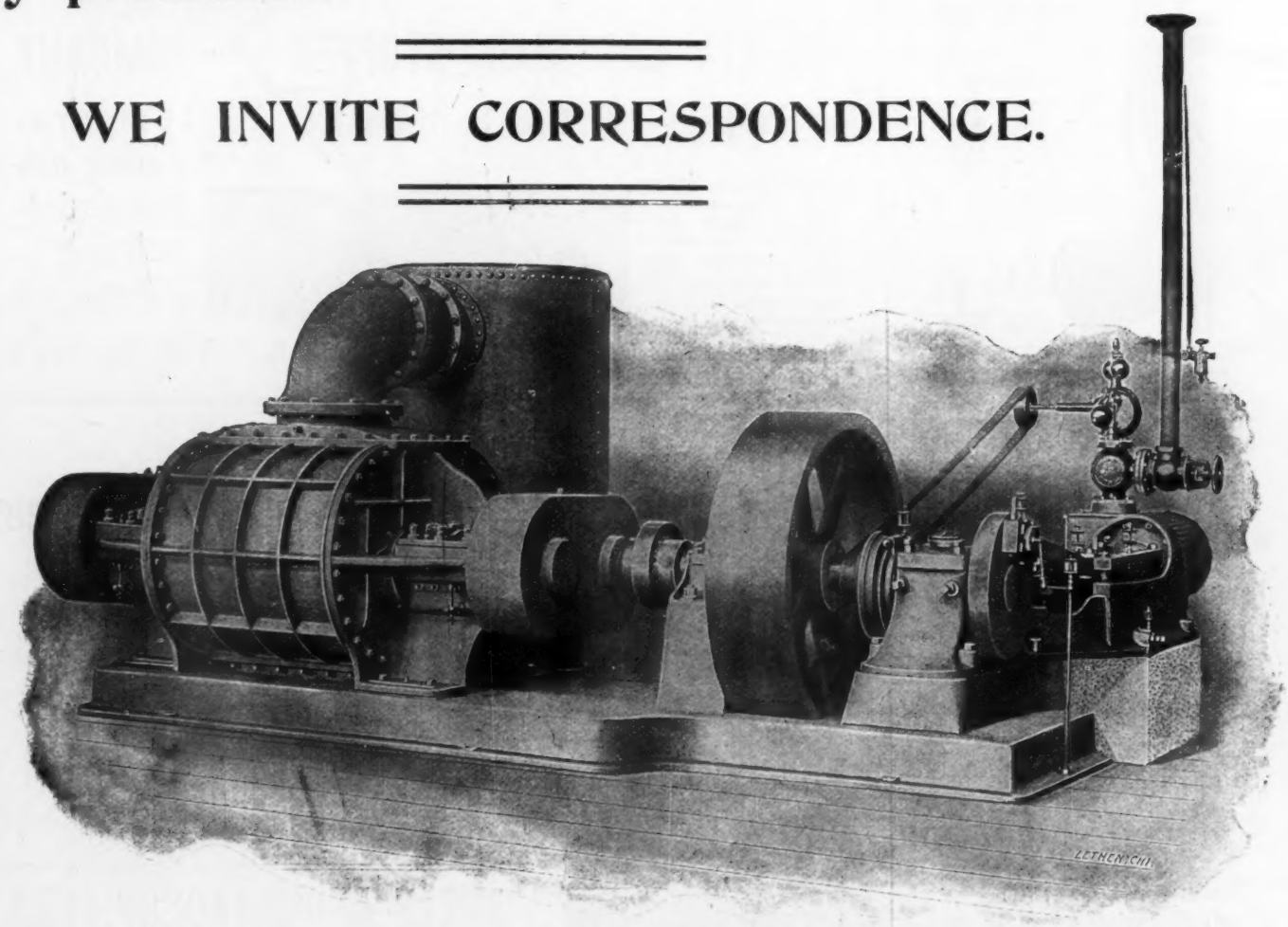

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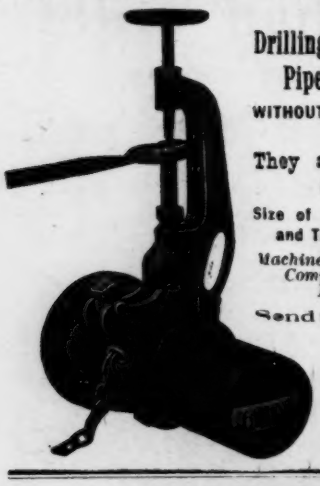

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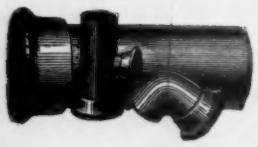

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Humphrey Crescent Instantaneous Water Heater

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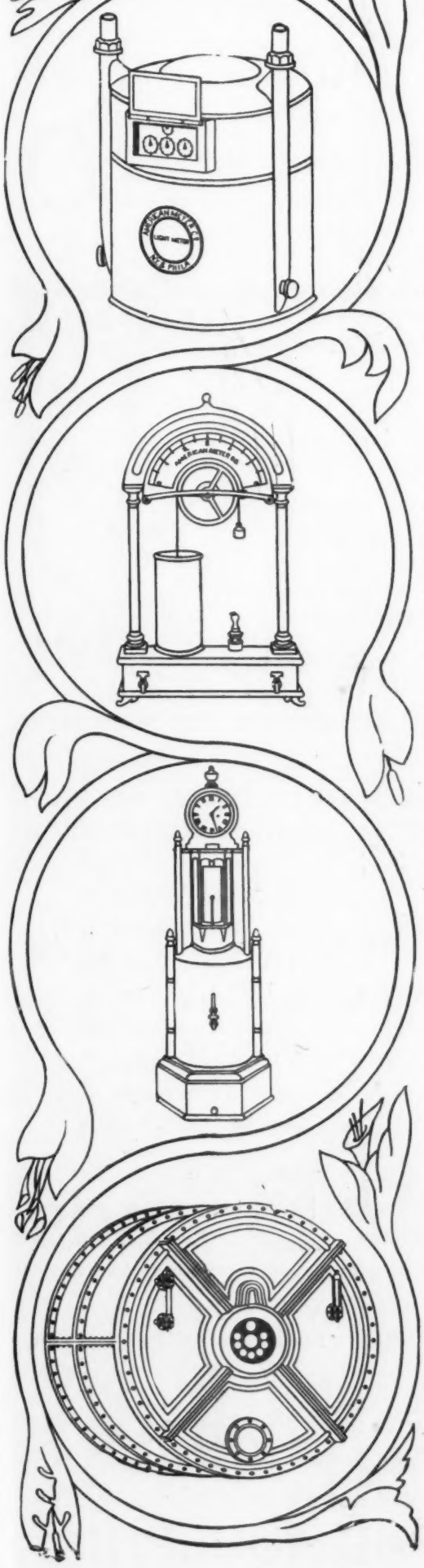
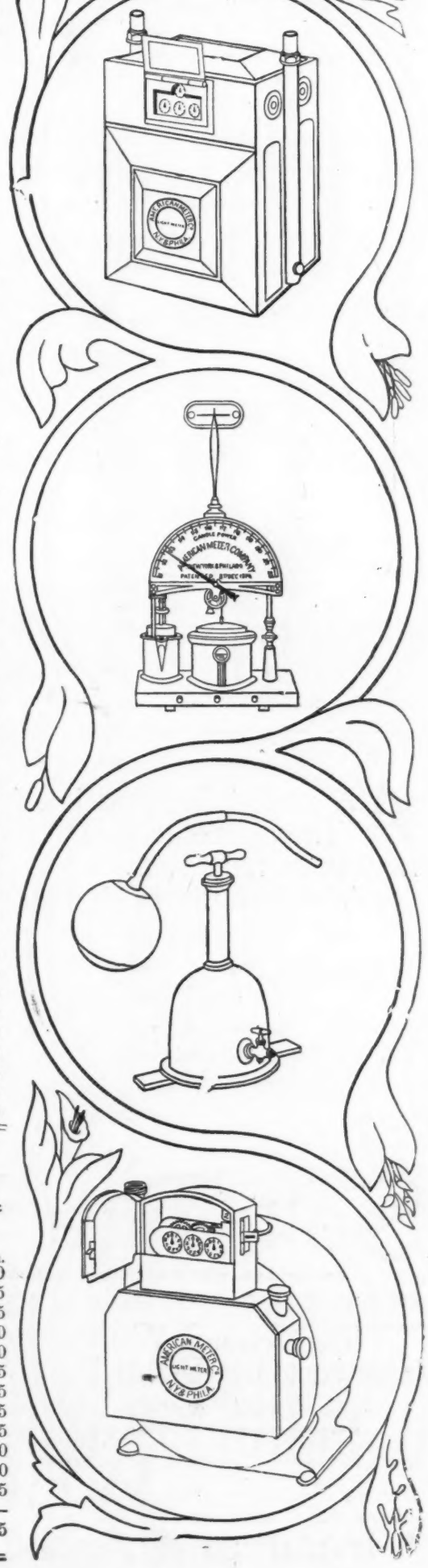




## PUBLIC LIGHTING TABLE.

### OCTOBER, 1903.

| DAY OF WEEK. | DATE. | Table No. 1. FOLLOWING THE MOON. Light. | Extinguish. | Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light. | Extinguish. |
|---|---|---|---|---|---|
| | | | | P.M. | A.M. |
| Thu. | 1 | 1.00 AM | 4.50 AM | 5.30 | 5.00 |
| Fri. | 2 | 2.00 | 4.50 | 5.30 | 5.00 |
| Sat. | 3 | 2.50 | 4.50 | 5.30 | 5.00 |
| Sun. | 4 | 3.50 | 5.00 | 5.30 | 5.00 |
| Mon. | 5 | No L. | No L. | 5.30 | 5.00 |
| Tue. | 6 | No L. FM | No L. | 5.30 | 5.00 |
| Wed. | 7 | No L. | No L. | 5.30 | 5.00 |
| Thu. | 8 | 6.00 PM | 8.00 PM | 5.20 | 5.10 |
| Fri. | 9 | 6.00 | 8.40 | 5.20 | 5.10 |
| Sat. | 10 | 6.00 | 9.20 | 5.20 | 5.10 |
| Sun. | 11 | 5.50 | 10.20 | 5.20 | 5.10 |
| Mon. | 12 | 5.50 | 11.10 | 5.20 | 5.10 |
| Tue. | 13 | 5.50 LQ | 12.20 AM | 5.20 | 5.10 |
| Wed. | 14 | 5.50 | 1.20 | 5.20 | 5.10 |
| Thu. | 15 | 5.50 | 2.30 | 5.10 | 5.20 |
| Fri. | 16 | 5.50 | 3.40 | 5.10 | 5.20 |
| Sat. | 17 | 5.50 | 5.10 | 5.10 | 5.20 |
| Sun. | 18 | 5.40 | 5.20 | 5.10 | 5.20 |
| Mon. | 19 | 5.40 | 5.20 | 5.10 | 5.20 |
| Tue. | 20 | 5.40 NM | 5.20 | 5.10 | 5.20 |
| Wed. | 21 | 5.40 | 5.20 | 5.10 | 5.20 |
| Thu. | 22 | 5.40 | 5.20 | 5.00 | 5.30 |
| Fri. | 23 | 5.40 | 5.20 | 5.00 | 5.30 |
| Sat. | 24 | 5.40 | 5.20 | 5.00 | 5.30 |
| Sun. | 25 | 8.10 | 5.20 | 5.00 | 5.30 |
| Mon. | 26 | 9.00 | 5.20 | 5.00 | 5.30 |
| Tue. | 27 | 10.00 FQ | 5.20 | 5.00 | 5.30 |
| Wed. | 28 | 10.50 | 5.20 | 5.00 | 5.30 |
| Thu. | 29 | 11.50 | 5.20 | 4.45 | 5.35 |
| Fri. | 30 | 12.40 AM | 5.20 | 4.45 | 5.35 |
| Sat. | 31 | 1.40 | 5.20 | 4.45 | 5.35 |









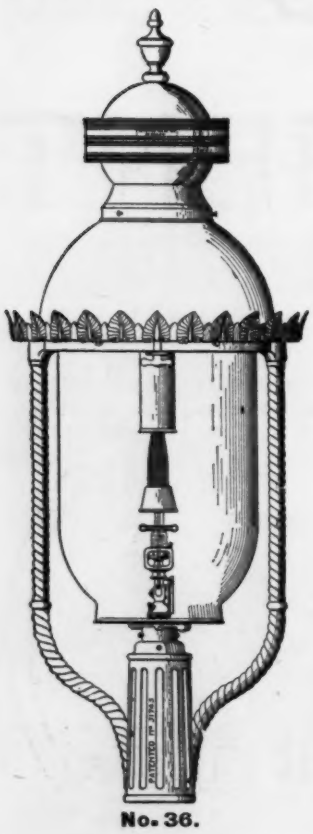
## TOTAL HOURS LIGHTING DURING 1903.

| By Table No. 1. | Hrs.Min. | By Table No. 2. | Hrs.Min. |
|---|---|---|---|
| January | 245.00 | January | 423.20 |
| February | 192.00 | February | 355.25 |
| March | 201.00 | March | 355.35 |
| April | 167.20 | April | 298.50 |
| May | 152.00 | May | 264.50 |
| June | 131.00 | June | 234.25 |
| July | 140.40 | July | 243.45 |
| August | 156.20 | August | 280.25 |
| September | 171.20 | September | 321.15 |
| October | 198.20 | October | 374.30 |
| November | 216.30 | November | 401.40 |
| December | 232.10 | December | 433.45 |
| Total, yr. | 2203.40 | Total, yr. | 3987.45 |

NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

# WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

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No. 38.

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The formula is simple-

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IT IS A GUARANTEE AND A PROTECTION.

# Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

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***And your profit isn't merely dollars and cents.***

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**For the Six Months Ending July 1, 1903, has been Awarded Contracts in the Following Places for**

## Standard Double-Superheater Lowe Water Gas Apparatus.

| | | |
|---|---|---|
| Rochester, N. Y. | Brooklyn, N. Y. | Waltham, Mass. |
| Baltimore, Md. | Hempstead, N. Y. | Dover, Del. |
| Chicago, Ills. | Chester, Pa. | Allentown, Pa. |
| Amesbury, Mass. | Lynn, Mass. | Savannah, Ga. |
| Aberdeen, S. D. | Newark, N. J. | New York (Central Union Co.) |
| Winsted, Conn. | Washington, D. C. | Cicero, Ills. |
| Canon City, Col. | Boone, Ia. | Chicago (Ogden Co.) |
| Schenectady, N. Y. | Pueblo, Col. | Easton, Pa. |
| Hagerstown, Md. | Charlotte, N. C. | Lawrence, Mass. |
| Malden, Mass. | Fall River, Mass. | Council Bluffs, Ia. |
| Bridgeport, Conn. | Duluth, Minn. | Chattanooga, Tenn. |
| Albert Lea, Minn. | New York (Mutual Co.) | |

TOTAL SETS TO JULY 1, 1903, . . . . . 51
TOTAL DAILY CAPACITY, . . . . 55,150,000 cubic feet.
TOTAL SETS TO DATE, . . . . . 498
TOTAL DAILY CAPACITY, . . . . 354,830,000 cubic feet.

## The United Gas Improvement Company,

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Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
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EXCELSIOR FIRE BRICK & CLAY
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OFFICE, 418 to 422 East 23d St., N. Y.

**Clay Gas Retorts,**
BENCH SETTINGS,
Fire Brick, Tiles, Etc.

**GEROULD'S IMPROVED RETORT CEMENT**

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In Kegs, 100 to 200 " " 6 " "
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To Retain Fluid Material of Any Sort.

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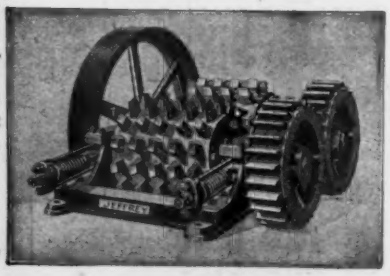

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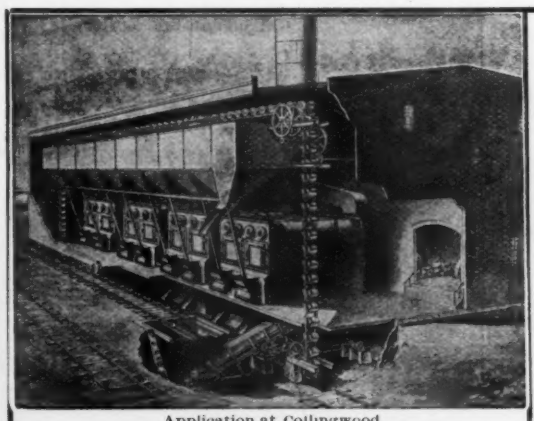

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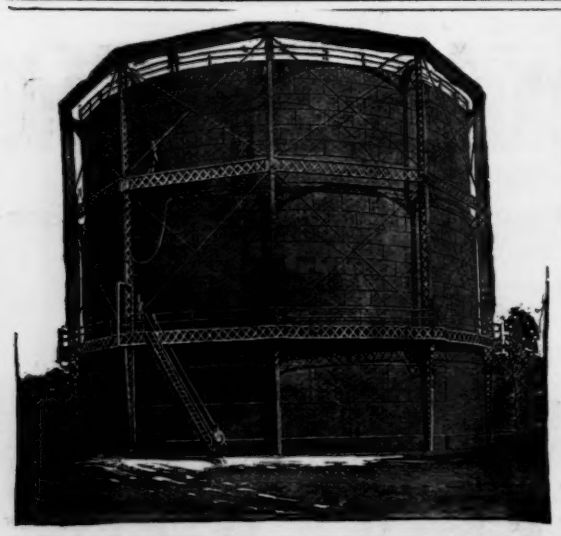

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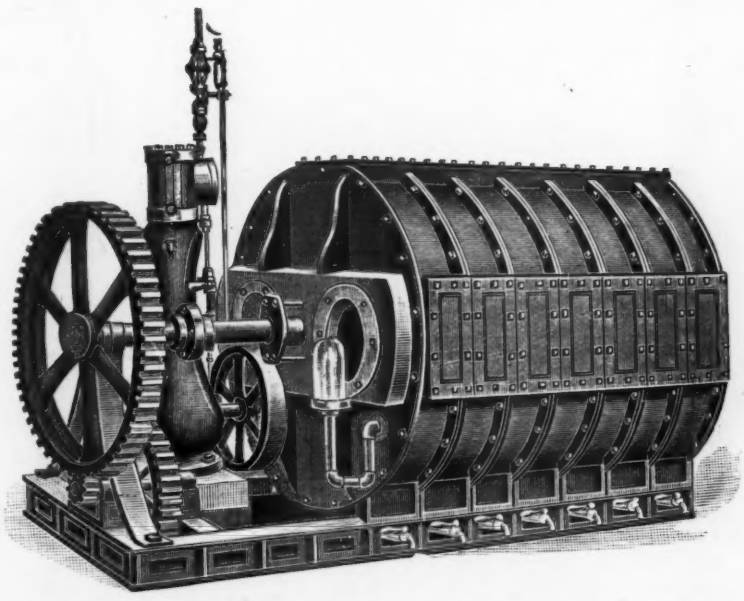

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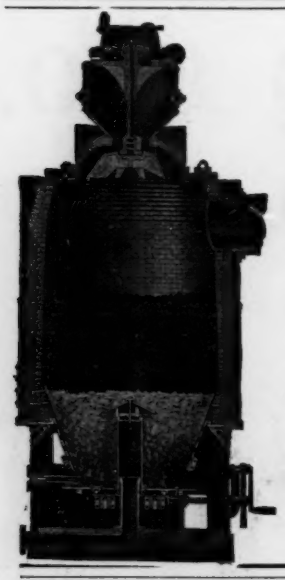

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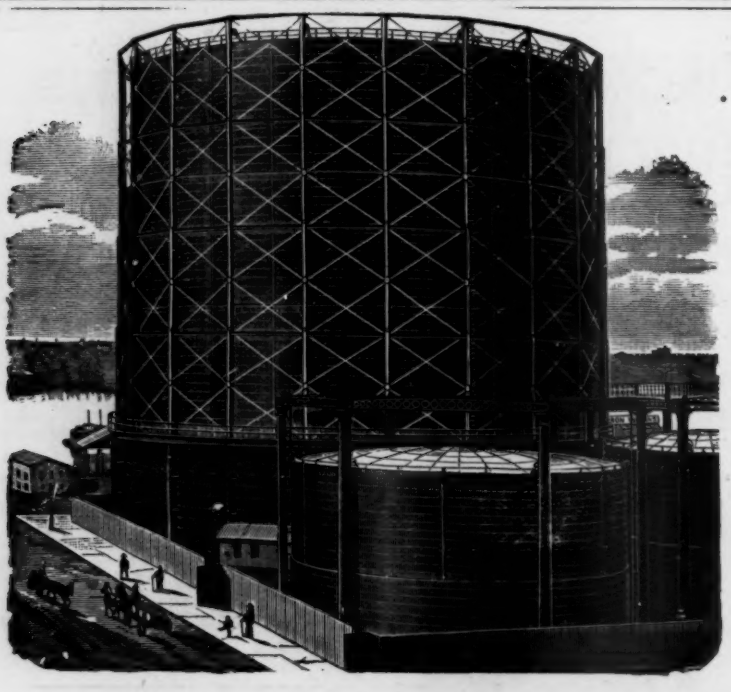

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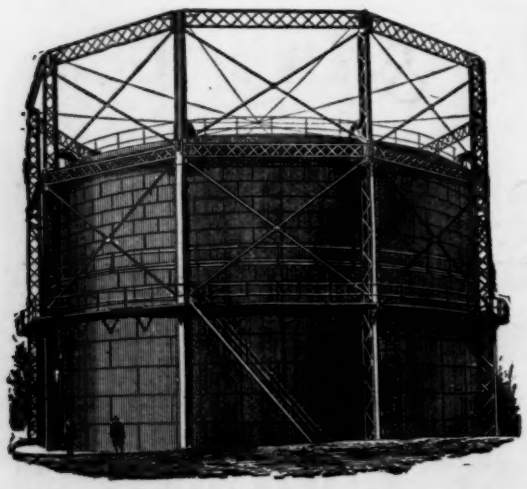

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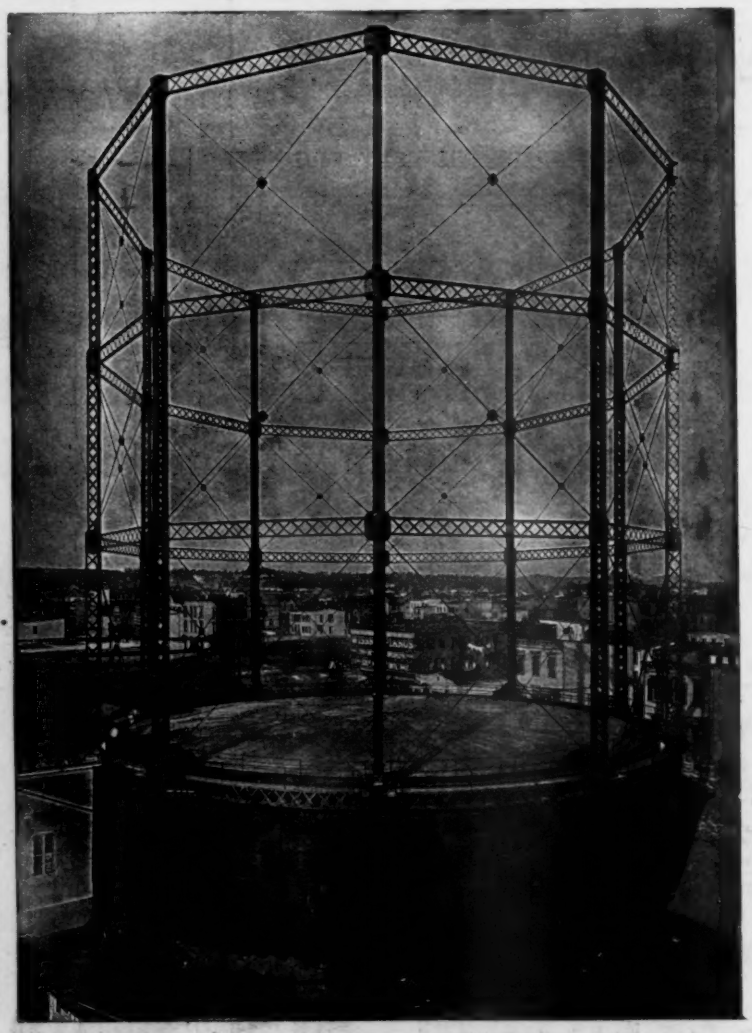

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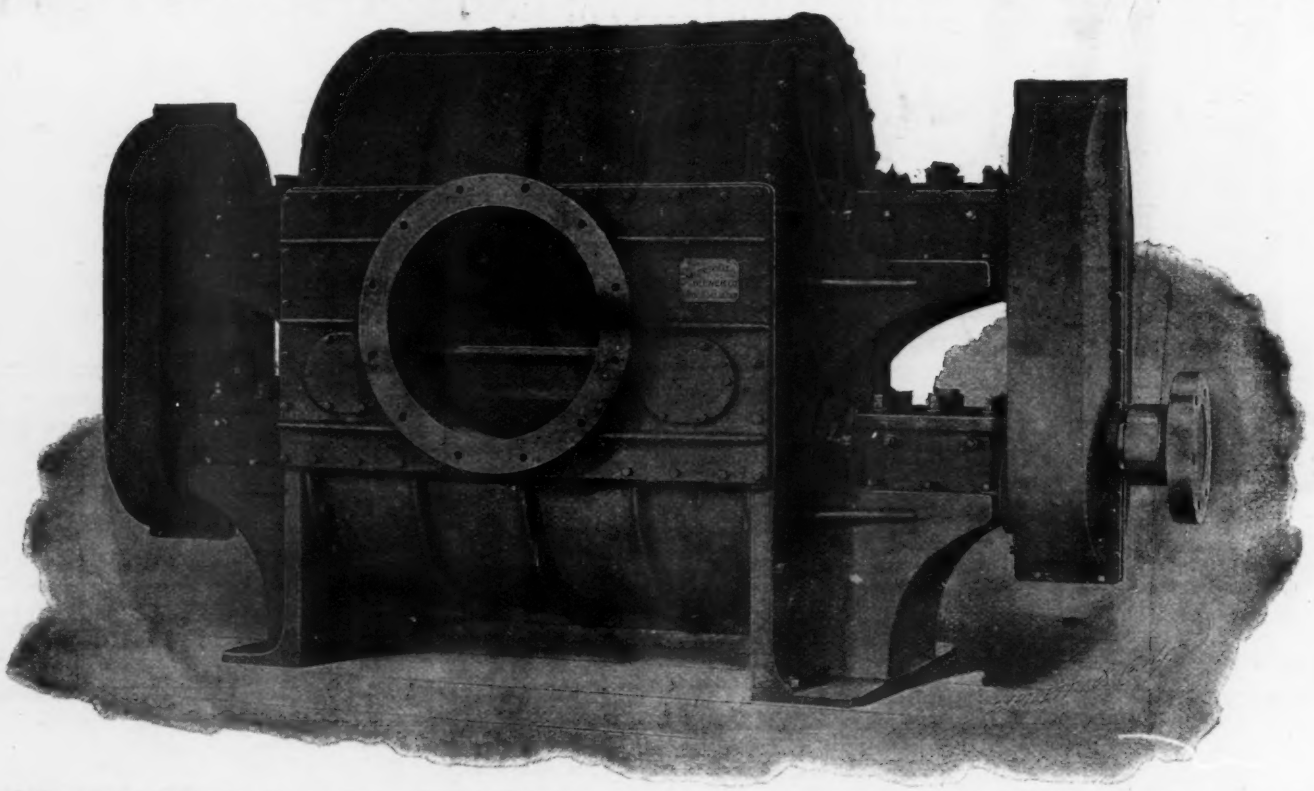

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